

ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

WITH
INTERNATIONAL ABSTRACT

Official Journal American College of Physical Therapy

EDITORIAL STAFF

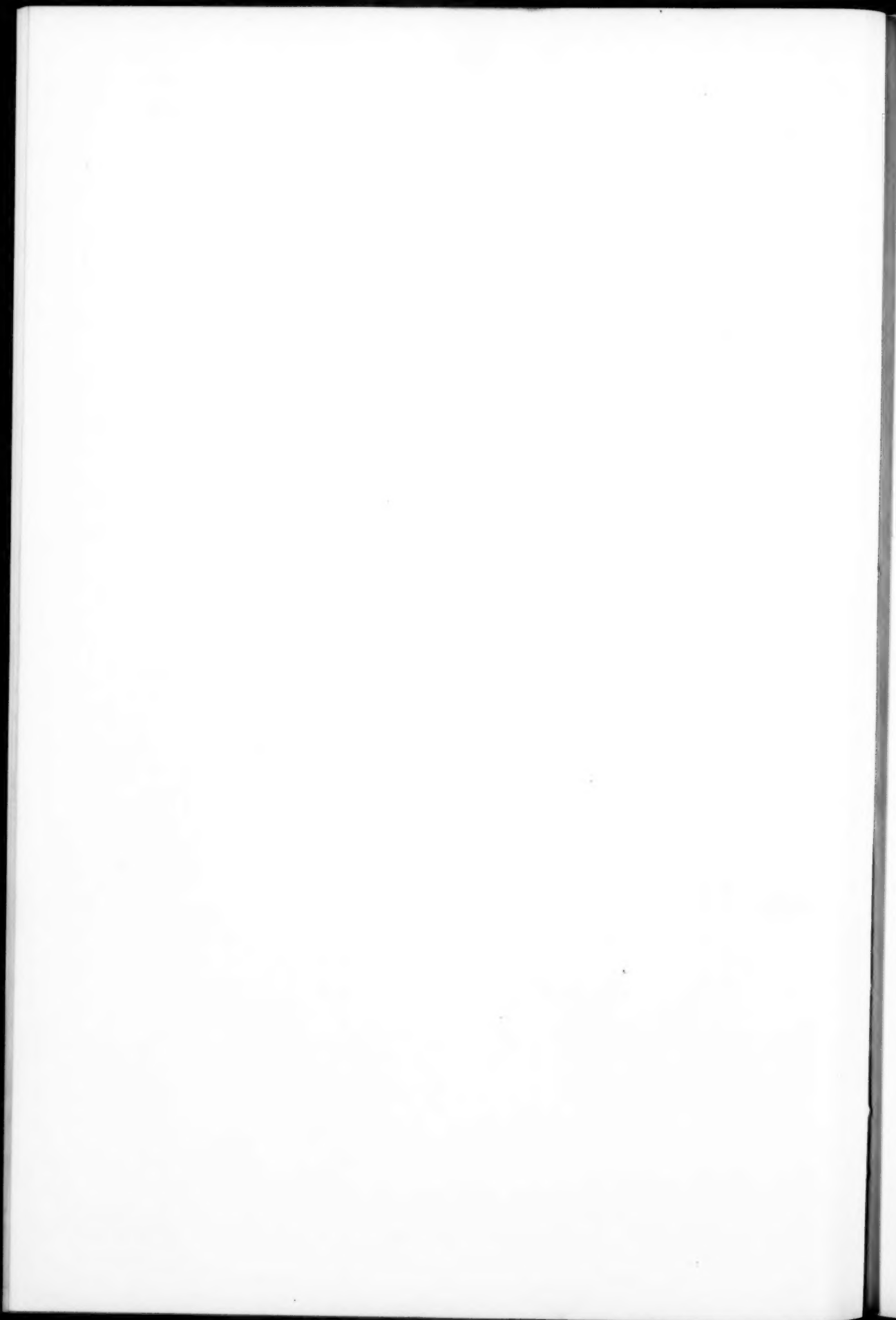
DISRAELI KOBAK, M. D., Editor

GEORGE C. ANDREWS, M. D. - - - New York
ALBERT BACHEM, Ph. D. - - - - - Chicago
R. C. BAUMGARTEN, M. D. - - - - - Seattle
WILLIAM L. CLARK, M. D. - - - Philadelphia
HARRY H. BOWING, M. D., Mayo Clinic, Rochester
IRA O. DENMAN, M. D. - - - - - Toledo
J. C. ELSOM, M. D. - - - - - Madison
F. H. EWERHARDT, M. D. - - - - - St. Louis
R. E. FRICKE, M. D. - Mayo Clinic, Rochester
J. U. GIESY, M. D. - - - - - Salt Lake City
ABRAHAM J. GOTTLIEB, M. D. - Los Angeles

E. N. KIME, M. D. - - - - - Indianapolis
HARRY LESLIE LANGNECKER, M. D., Stanford U.
PROF. VICTOR E. LEVINE - - - - - Omaha
HORACE LOGRASSO, M. D. - - - - - Perrysburg, N. Y.
EDGAR A. MAYER, M. D. - - - - - Saranac Lake
ROSWELL T. PETTIT, M. D. - - - - - Ottawa, Ill.
CURRAN POPE, M. D. - - - - - Louisville
CHAS. E. STEWART, M. D. - - - - - Battle Creek
F. H. WALKE, M. D. - - - - - Shreveport
A. D. WILLMOTH, M. D. - - - - - Louisville

ELKIN P. CUMBERBATCH, M. A., MB., (Oxon) M. R. C. P., London
GUIDO HOLZKNECHT, Dr. Med. - - - - - Vienna
A. ROLLIER, M. D. - - - - - Leysin, Switzerland
ALBERT E. STEIN, Dr. Med. - - - - - Wiesbaden
AXEL REYN, M. D. - - - - - Copenhagen
FRANZ NAGELSCHMIDT, Dr. Med. - - - - - Berlin
DR. JOSEF KOWARSCHIK - - - - - Vienna
SIR HENRY GAUVAIN, M. D., M. Ch. - - - - - Alton, England

ALBERT F. TYLER, M. D., Managing Editor



ARCHIVES OF PHYSICAL THERAPY, X-RAY RADIUM

VOL. IX

NOVEMBER, 1928

No. 11

NEW GROWTHS OF THE CHEST WALL, PLEURA AND LUNGS*

ALBERT F. TYLER, B. Sc., M. D.
OMAHA

That new growths of the chest wall, pleura and lungs are much more frequent than is generally known would seem to be borne out by my own experience as well as that of others. These growths are so serious for the patient that any study which will give a clearer understanding of the symptoms, diagnosis, pathology and treatment is well worth while.

FREQUENCY

Ewing (1) states that "primary malignant tumors of the lung form about 1 per cent of all cancers." Kaufman (1) places the proportion at 1.83 per cent. Moise (2) in 1921 reported 375 necropsies performed at the New Haven Hospital in which five cases of primary cancer of the lung were found. This was 1.38 per cent of all autopsies and 17 per cent of all cancers. This rate is much higher than the general average at that time, and is held by some authorities to show that this type of cancer is on the increase. Others contend that this type of cancer is probably not on the increase, but that due to refinements in diagnosis, it is being recognized more frequently antemortem.

Males are much more frequently affected than females, the ratio being 71.9 per cent males to 24.8 per cent females. Adler's (1) statistics show 113 out of 356 cases reported occurred in the sixth decade of life. This refers to carcinoma

of the lung. Sarcomas, on the other hand, are more frequent in the young.

Rubenstone and Schwartz (3) report 11 cases of primary cancer of the lung in which the right lung was involved five times, and the left three times. Jackson (4) reports the right side involved 40 per cent and the left side 47 per cent, both sides 9 per cent in 187 collected cases.

ETIOLOGY

Ewing (1) states the chief etiological factor is tuberculosis. In spite of this statement by Ewing, many cases have been reported in which there was no history of tuberculosis and no positive physical or autopsy findings. In my own series of cases there has not been a single case of tuberculosis. This leads me to think that the presence of primary cancer in the lung of the tuberculous patient is a coincidence rather than a causative factor. Others have cited influenza as a cause of primary cancer of the lung. Here, too, the relationship seems far-fetched.

In many cancerous lungs, anthracosis is extremely marked and in the case of the Schneeberg miners, this condition has been held responsible as the cause of the disease.

PATHOLOGY

Primary cancer of the lung may arise from one of three sources, viz., the bronchial mucosa, the mucous glands of the bronchus or the alve-

*Read at seventh annual meeting, American College of Physical Therapy, Chicago, Oct. 10, 1928.

olar epithelium. The greater number arises from the mucosa of the bronchus. Passler (4), in 1896, considered 87 per cent of lung carcinomas as of bronchial origin. Those cases arising from the glands will show the microscopic picture of an adenocarcinoma. Tumors which have metastasized to the lung from distant parts of the body show the characteristics of the primary tumor.

CLINICAL FEATURES

Malignant new growths in the lung present one characteristic symptom which is found in all cases, a cough, which, at first is nonproductive, but the sputum may later become blood tinged. In Jackson's (4) series of 128 collected cases, cough was present in 100 per cent, expectoration in 89 per cent, hemoptysis in 58 per cent, dyspnea in 62 per cent and pain in the chest in 81 per cent. The cough may be continuous or come at intervals; dyspnea is severe in some. One of our patients (Fig. 8.) described the feeling as though "something flapped back and forth in his air tubes when he breathed." After introducing the bronchoscope we could see this ball valve motion taking place as he breathed. This was due to the growth which arose from the bronchus near the bifurcation, having a pedicle which allowed the larger top of the tumor to bend into and occlude the lobe bronchus on inspiration, then slip out into the larger bronchus on expiration. Hemoptysis is

irregular in its appearance, frequently showing as a blood-tinged sputum or a blood clot raised during a paroxysm of coughing. Severe hemorrhage is rare. Pain in the chest is a frequent symptom. In one of our patients, (Fig. 7) the pain was referred to the left shoulder and down the left arm. This pain was so severe that the patient was incapacitated. Naturally the early diagnosis was "neuritis". Roentgen examination of the chest, however, revealed the growth primary in the left upper lobe bronchus.

PHYSICAL SIGNS

The physical signs are typically those of bronchial obstruction. Depending upon the degree of obstruction, percussion may reveal dullness or even flatness. Auscultation may show rales or absence of breath sounds when the obstruction is complete. Unless there is abscess or fluid present, the physical signs will be confined to one lobe. The signs may change from day to day depending upon the variation in the amount of obstruction. The variability of the signs should lead one at once to the diagnosis of bronchial obstruction. Should there be any displacement of the heart, it will usually be toward the affected side, due to lack of aeration of that side and the compensatory expansion of the opposite side. Bronchoscopic examination will usually reveal the tumor and accurately locate the point of origin.

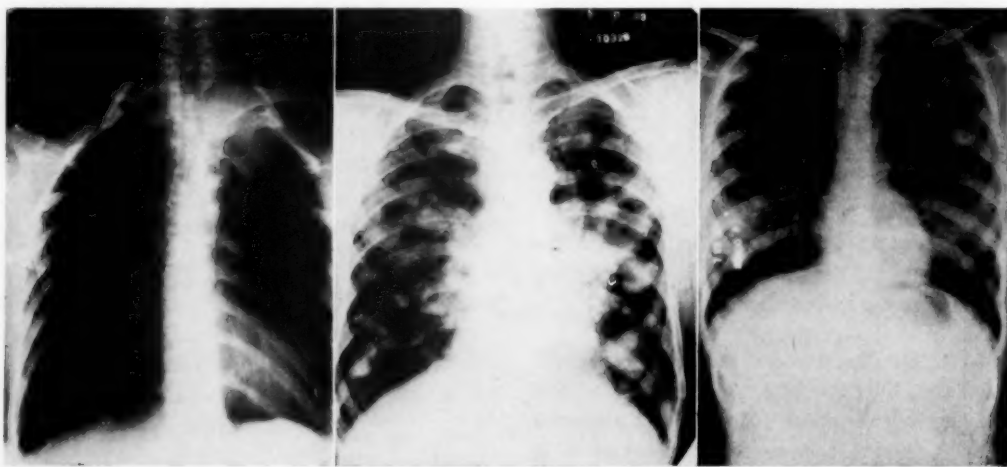


Fig. 1. Primary sarcoma involving the left first, second, third and fourth ribs.

Fig. 2. Mixed cell tumor of the parotid with metas-

tases into the lungs. This patient also had metastases into the bony system.

Fig. 3. Primary sarcoma of the left fibula, metastasis through the blood stream into the left lung.

The roentgen examination has proven of great value in our hands, enabling us to make a diagnosis of new growth in the lung before other physical signs were pronounced enough to make diagnosis certain. The injection of iodized oil into the bronchi, followed by roentgen examination helps still further in determining the exact location of the growth. One can frequently see a convex filling defect in the iodized-oil-filled bronchus.

DIAGNOSIS

Atkinson (5) says "lung tumors are most frequently diagnosed as tuberculosis." This error is especially apt to occur in the younger patient. Jackson reports a case of a young woman of 24 years who had been wrongly diagnosed as tuberculosis and treated for three years before the bronchoscopic examination revealed the true condition. Bridges and Moser (6) report four primary cancers of the lung in two of which the diagnosis was made by finding cancer tissue in the aspirated fluid from the pleural cavity. The third was diagnosed by exploratory section and microscopical examination while the fourth was proven at autopsy.

In patients who have as a complication a pleural effusion, the diagnosis is difficult. Perry (7) stresses the point by saying "a patient should never be sent to the x-ray laboratory without first removing a pleural effusion because the latter entirely masks the x-ray picture." Another source of error in the roentgen examination may

be due to the presence of inflammatory changes in the portion of the lung ventilated by the affected bronchus. These changes are frequently so pronounced that they mask the true cause of the disability. Where care and intelligence are employed in making the deductions from the roentgen examination, we agree with J. N. Hall (8), when he says "the x-ray furnishes valuable evidence in all new growths within the chest and in some of these conditions a positive diagnosis can be made from its use alone."

Grove and Kramer (9) call attention to the value of the bronchoscope in making an antemortem diagnosis of cancer of the bronchi. This has also been emphasized by Jackson in numerous contributions to medical literature. It would seem that with due appreciation of the symptoms of bronchial obstruction, the physician, after completing a careful physical examination, should urge the employment of roentgen examination of the chest followed by bronchoscopic examination. Where all these methods are employed, we believe antemortem diagnosis of pulmonary new growths can be made in the majority of cases.

In new growths in the lung which have metastasized from a primary new growth elsewhere in the body, the roentgen findings are so characteristic that no doubt should be entertained as to the character of the shadow.

It is difficult to differentiate new growths in the mediastinum from aneurysm of the aorta,



Fig. 4. Teratoma, primary in the left testicle. Metastases through the blood stream into both lungs.
Fig. 5. Primary sarcoma in the left lung.

Fig. 6. Same patient as Fig. 5 after high voltage x-ray treatment.

especially if the aneurysmal sac is filled with an organized blood clot. In cases of this type a therapeutic dose of high voltage roentgen ray should be given. The aneurysm will be unaffected by it, while a new growth will diminish in size.

Pancoast (10) calls attention to the need of careful examination for possible new growths in the apex of the lung or even arising from the ribs or vertebrae at this level. In one patient in our series, (Fig. 1) a girl of 17 years had been treated several months previously for neuritis involving the nerves coming off the left brachial plexus. At the time we saw her, partial paralysis had occurred. Roentgen examination revealed a primary sarcoma in the right upper lobe region, springing from the side of the vertebrae and destroying the first, second and third ribs. Roentgen therapy caused rapid recession of the tumor mass.

METASTASES OF PRIMARY LUNG TUMOR

Fried (1) calls attention to the cause of distant metastases in primary bronchial carcinoma. These, he suggests, are due to the structure of the growth frequently soft and abundantly cellular and of slow growth which gives time for metastasis to occur before a diagnosis is made and treatment instituted. The frequent metastasis to the brain is due to the lack of a barrier in the circulation between the lungs and the brain which allows malignant emboli to pass freely along the blood stream lodging in the terminal cerebral arteries.

Kitzmiller (12) reports a patient suffering from a primary alveolar carcinoma of the lung, wrongly diagnosed as tuberculosis, which metastasized through the lymphatics to the peribronchial lymph glands and thence to the epicardium.

Clayton (13) reports a patient who died of primary carcinoma of the bronchus which had metastasized to the liver, showing as a white mass the size of the palm in the central portion of the left lobe. Adler's statistics show the liver is invaded in 28.5 per cent, the adrenal in 10 per cent and the voluntary muscle in 2 per cent.

Gibson and Findlay (14) report a primary carcinoma of the bronchus which metastasized to the voluntary muscle and the skin.

Lettule and Jaqueline (15) report a patient who had a carcinoma of the bronchus in one lung which metastasized to the opposite lung. The primary growth projected into the bronchus and some of the active proliferating cells were breathed into the bronchi of the opposite side where they lodged and grew.

Primary tumors of the pleura are much less frequent than those of the bronchi. Heise and Trudeau (16) report a case of primary mesothelioma of the pleura which at first was wrongly diagnosed as tuberculosis because of spontaneous pneumothorax and effusion. After several aspirations, the fluid became serosanguineous and the roentgen signs were interpreted as primary tumor of the pleura which was confirmed at autopsy.

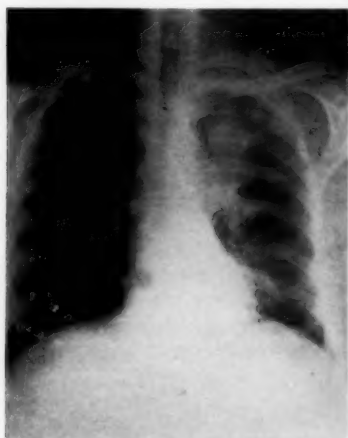
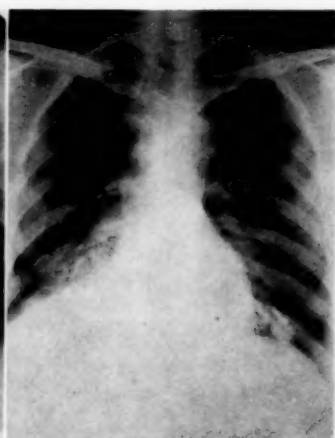


Fig. 7. Primary carcinoma in the bronchus of the upper left lobe of the lung.



Fig. 8. Primary carcinoma in the main bronchus of



the right upper lobe of the lung.
Fig. 9. Primary carcinoma in the right lower lobe, main bronchus.

Robertson (17) contends that only sarcomas can be primary in the pleura because of the embryonic origin of the pleura from the entoderm. He thinks all carcinomas of the pleura are located there by direct extension or metastasis.

Zeckiver (18) reports a case of primary malignant tumor of the pleura which metastasized to the cerebrum and adrenal. This tumor showed spindle cells of fibroblastic nature as well as epithelial cells. The author contends that primary tumors of the pleura should, therefore, be designated "mesothelioma."

METASTATIC NEW GROWTHS IN THE LUNG

Metastatic new growths in the lung may arise from primary sources of almost any character elsewhere in the body. We have observed metastatic tumor in the lung with the primary tumor in the breast, the ovary, the testicle, the parotid gland, the bone, the prostate, the lymph glands, the thyroid and a malignant lingual thyroid.

The roentgen ray is invaluable in making a diagnosis of secondary tumors in the lung. Those which have metastasized through the bloodstream can be detected when so small that physical findings are entirely negative. Those which have entered the lung through the lymphatics can be demonstrated before physical signs are obtainable. The location and extent of the

disease can be definitely determined in a manner surpassing all other signs.

TREATMENT

In metastatic new growths in the lung the only helpful therapy is high voltage x-ray. Surgery is impractical and inadvisable. In primary cancers of the bronchus, several different methods of attack are available. Our experience with high voltage x-ray therapy corresponds with that of Jackson and others. In our experience, however, the tumor would reduce to the point of great relief, but in most cases, would not entirely disappear. Consequently after a time, the regrowth would bring about the old symptoms and eventually reach a stage where x-ray therapy failed to give benefit. Because of this experience we have been combining x-rays and radium. The radium is applied after the method of Yankauer through the bronchoscope in the form of needles which are plunged into the base of the tumor. By this method, the infiltration in the surrounding lung is taken care of by the roentgen rays while the local tumor is destroyed by the radium. Mesotheliomas of the pleura respond to high voltage x-rays.

REFERENCES

1. "Neoplastic Diseases". James P. Ewing; p. 786, 1919, W. B. Saunders Co.
2. "Primary Carcinoma of Lungs." T. S. Moise; Arch. Int. Med., 28: 733, Dec., 1921.



Fig. 10. Destruction of the left third rib in the anterior axillary line, recurrent after amputation of the breast for carcinoma.



Fig. 11. Infiltrating type of carcinoma in the left



lung, metastasizing through the lymphatics from the left breast into the mediastinal region.
Fig. 12. Multiple metastatic carcinomas in both lungs metastasizing through the blood stream from the primary growth in the breast.

3. "Primary Cancer, Analysis of Eleven Cases." *A. I. Rubenstone and M. Schwartz; M. J. and R.*, 126; 719-722, Dec. 21, 1927.
4. "Primary Carcinoma of the Bronchi." *Thomas McCrae, M.D., Elmer H. Funk, M.D., and Chevalier Jackson, M.D.*
5. "Pulmonary Neoplasms, Prevalence, Diagnosis and Treatment." *C. E. Atkinson; Am. Rev. Tuberc.*, 14:556-566, November, 1926. Abs. California and West. Med., 25:750-751, December, 1926.
6. "Primary Carcinoma of Lungs, Report of Cases." *W. O. Bridges and R. A. Moser; Nebraska M. J.*, 7: 377-381, November, 1922.
7. "Primary Carcinoma of Lung." *M. W. Perry; Int. Clin.*, 3: 194-200, September, 1926.
8. "New Growths Within Chest." *J. H. Hall; Am. J. of Roentgenol.*, 10: 182-187, March, 1923.
9. "Primary Carcinoma of Lung, (Clinical and pathologic study from Cook County Hospital, 21 necropsies and 3 biopsies)." *J. S. Grove and S. E. Kramer; Am. J. M. Sc.*, 171:250-282, February, 1926.
10. "Importance of Careful Roentgen Ray Investigations of Apical Chest Tumors." *H. K. Pancoast; J. A. M. A.*, 83: 1407-1411, November 1, 1924.
11. "Primary Carcinoma (Further study with particular attention to incidence, diagnosis and metastases to central nervous system)." *B. M. Fried; Arch. Int. Med.*, 40: 340-363, September, 1927.
12. "Primary Cancer, Case with Unusual Metastases." *K. V. Kitzmiller; Arch. Path. and Med. Lab.*, 4:356-358, September, 1927.
13. "Primary Carcinoma of Bronchus with Metastases to Liver and Kidneys." *E. S. Clayton; S. Clin. N. Amer.*, 7: 286-290, April, 1927.
14. "Case of Primary Carcinoma of Lung." *H. G. C. Gibson and G. M. Findlay; Lancet*, 1:21:22, 1923.
15. "Air-Borne Metastases in Lung." *M. Letulle and A. Jaqueline; Presse. Med.*, 32: 825-826, October 18, 1924. Abs. *J. A. M. A.*, 83: 1720, November 22, 1924.
16. "Primary Mesothelioma, Case with Pneumothorax and Mediastinal Hernia First Symptoms." *F. H. Heise and F. B. Trudeau; Am. Rev. Tuberc.*, 16: 92-99, July, 1927.
17. "Endothelioma of Pleura." *H. E. Robertson; J. Cancer Research*, 8: 317-375, October, 1924.
18. "Mesothelioma of Pleura." *I. T. Zeckwer; Arch. Int. Med.*, 34: 191-205, August, 1924.
19. "Two Cases of Lung Tumor Treated Bronchoscopically." *S. Yankauer; N. Y. Med. J.*, 115: 741-743, June 21, 1922.

ELECTROCOAGULATION OF THE TONSILS; TECHNIC AND RESULTS*

GREGG A. DILLINGER, M.D.
PITTSBURGH

The application of diathermy for the coagulation of tonsils has been in use in France for fifteen years, not as the operation of choice, but when tonsillectomy was for some reason contra-indicated. A committee was appointed to make a report on diathermy in otolaryngological work in 1924. This committee comprised Portmann of Bordeaux, Bourgeois and Poyet of Paris, and Lamonthe of Limoges. In their report to the Academy of Medicine in Paris, they stated that electrocoagulation of the tonsils was very successful and they recommended it highly in those cases in which surgical tonsillectomy was contra-indicated or refused. When such men, who are real leaders in original research, clinical experience and surgical knowledge make these statements, and when the experience of others testify to the splendid and most gratifying re-

sults, then this method demands of the specialist as well as the general practitioner its proper place in throat surgery. It demands it first because it is absolutely safe; second it obviates hospitalization, the dread of which keeps thousands of patients from having their tonsils operated; third, the patient can continue at his occupation.

Since reading a paper before the Allegheny County Medical Society in Pittsburgh, two years ago, on this subject, there are more than 25 who are now using it to some greater or lesser extent. I believe a great number of our more progressive men will soon take it up because of the fact that it marks a definite progress in otolaryngologic surgery. Physical therapy is now rapidly coming into its own. It is already recognized together with medicine and surgery as the third great factor in the healing art. As d'Arsonval says: "We are only at the dawn of the therapeutic application of diathermy."

*Read at sixth annual meeting, American College of Physical Therapy, Chicago, Nov. 3, 1927.

You will ask, why look for another method? Is not Tonsillectomy as performed either under local or general anesthesia satisfactory? De Land, Harlow Brooks, Chevalier Jackson, and others, are insisting that pneumonia and lung abscess are occurring too frequently following tonsillectomy. DeLand says: "Some technic must be devised to lessen the shock and the risk of absorption or aspiration of pathogenic microorganisms, because the two complications are happening too frequently and that too often the causal factor, tonsillectomy, is overlooked. I think it is rather apropos here to mention that two hours of the program of the Pennsylvania State Medical Society's meeting last month in Pittsburgh were devoted to, "How shall we treat lung abscesses following tonsillectomy?" Here we see the roentgenologist, and the bronchoscopist following the tonsillectomist, trying to cure what he has caused. I will tell you, in one brief sentence, how to cure lung abscess and pneumonia following tonsillectomy—by preventing them, and this can only be assured by the electrocoagulation method which makes them an absolute impossibility. Preventive medicine and surgery are, after all, the grandest parts of our science. So far we have only mentioned these two serious complications, and without further discussion, would simply mention the following, which are very common, some one or more in every tonsillectomy: hemorrhage and shock, secondary infection, trauma to soft tissue, accompanied often by edema, and later disagreeable effects from scar tissue, embolism, and last but not least, the danger that is always attendant upon the administration of a general anesthetic.

Before entering into the discussion of the technic of electrocoagulation, let us briefly consider two methods that have been tried within recent years, and to my mind, found wanting; namely, x-ray and radium. Murphy, Witherbee, Craig, Hussey and Strum, of the Rockefeller Institute, conducted a series of forty-six cases, which proved that by x-ray, they could bring about a definite diminution in the size of the hypertrophied tonsil, and that with the atrophy there occurred a disappearance or lessening of the exudate, and diminution of the bacterial flora, especially marked in the case of strepto-

coccus hemolyticus, but they could not prove the tonsil entirely sterile.

Again, the rays have to pass through so much tissue before reaching the tonsil, (the skin, superficial connective tissue, muscle, bone, more muscle, peritonsillar, cellular tissue and the fibrous capsule), so that only 25 per cent of the ray's strength reaches the tonsil. Yet this often caused the patient great discomfort from dryness of the mouth and throat, due to injury of the parotid and submaxillary glands. So the x-ray will not measure up as an ideal method.

Wells, of Washington, D. C., 1921, recognizing the fact that lymphoid tissue was easily destroyed by radium, began a series of experiments on the tonsil, and has been using it largely in his work since that time. He demonstrated that radium will cause an atrophy, almost to extinction of the tonsil, and that all germs are killed.

After submitting numerous tonsils, after treatment, to laboratory tests he found there was a degeneration and disintegration of lymphocytes, obliteration of the germinal cells, disappearance of the follicles and a shrinkage of the interstitial lymphatic tissue. (I might add here that electrocoagulation has the same reaction on the tissue as described here by Wells.)

The objections to radium are: taking it for granted that you have properly prepared needles placed in the tonsil, you cannot be absolutely sure as to the extent of the necrosis you will get. We know there is a radius of 4mm. of absolute destruction, and another radius of 4 mm. of extensive severe inflammation and then inflammation beyond that. So when you cannot limit your area of destruction and do not have your agent under your direct control and vision, you are taking some chance. And again, the needles must remain from one and one-half to three hours in position, and this is not a very pleasant procedure for the patient.

We will now consider the method of electrocoagulation with its technic. There are large numbers of diseased tonsils that cannot or should not be treated by tonsillectomy, such as those of patients having hemophilia, tuberculosis, nephritis, heart lesions, acute syphilis, etc., and there is a tremendous number of adults with diseased

tonsils who refuse operation. If electrocoagulation was used only in this large group of cases, it is a method that we should be extremely happy to welcome. It was in such selected cases that I first saw diathermy used by Georges Portmann of Bordeaux, and who has been using it with splendid success since 1913. My experience and technic were secured there during the summers of 1924 and 1925. After treating more than 250 patients during the past year and a half, I have now adopted it as my routine tonsil operation, and feel that I can say, modestly, that I know something about it and its results.

Now, as to the technic. The machine used should have not less than 1,500,000 oscillations per second. The machine I use gives 1,750,000 per second. This insures a smooth, soft current, and is very comfortable; no sparking or shock to the patient whatsoever. The next important feature is the setting of the machine, which is done in the following manner: Take three fourths of rheostat setting of machine; make a dead short between the two low voltage or surgical diathermy connections, and before turning on the machine, see that the spark gap is closed; after this turn on the machine and open spark gap gradually until you get a meter reading of 2,700 ma.; then take one of the diathermy cords and connect to a piece of block tin six inches by 10. The second cord, which holds the needle, is attached to the other surgical diathermy outlet. Now you have set the machine before the operation, and an amperage necessary to give coagulation has been definitely fixed. As the tonsil is made up of lymphocytes with very little organized tissue in it, it is speedily and easily destroyed by this amperage.

The next step of importance is the time of contact with the tonsil and the active electrode or needle. (Nothing but a needle should ever be used). The time is not limited by seconds, but by the reaction of the tissues to the active electrode or needle when you reach the point of coagulation, which is shown by a white ring appearing around the needle. This requires from one-half to two seconds; never longer.

These are the three important factors in the technic: first, setting the machine; second, type of active electrode; third, time of contact.

Now, as to the method of application. This is an office procedure. The patient is seated in any kind of an office chair desirable, and a large piece of block tin, six inches by ten inches is applied, without any soap or ointment to the bare skin of the patient's back and connected by an insulated cord to the machine. I use a 10 per cent solution of cocain, having wet the cotton on the applicator only once with the solution. This I quickly apply to the soft palate, around the tonsil, inside the cheek and the base of the tongue, repeating this five or six times with the same pledget of cotton, but no additional cocain. I use no more than four or five drops for the whole procedure. Now the throat and tongue are sufficiently anesthetized. I have never had a patient faint nor show the slightest sign of syncope. I never inject novocain for three reasons. First, there is the slight danger from the anesthetic; second, more fluid is added to the field which you wish to dehydrate; third, you get about as much reaction from the fluid injected into the soft tissues as you do from the diathermy. (Always use a wooden or glass tongue depressor.) Now, I take the needle, the end slightly curved, and put it from one-eighth to one-fourth inch into the tonsil, step on the foot switch, and in from one to two seconds the white ring appears around the needle. Release the current and take out the needle. This procedure is repeated until the tonsil has been covered with punctures about one-fourth of an inch apart. The number of punctures varies according to the size of the tonsil. On large tonsils I often use as many as 12 to 15, and in an old lady of 62, with tonsils the size of a hen's egg, I used 30 punctures at the first treatment. Do not go through the anterior pillar with the needle, but keep back of it one-fourth of an inch, and in front of posterior pillar the same distance. Then you will have very little reaction and no edema. When the tonsil is imbedded, or after first treatment, you must always have an assistant to retract the anterior pillar so that you can see the tonsil. Never place the needle where you cannot see it. I now paint the tonsil with some acriviolet, and the patient goes right on with his usual routine of the day.

My usual practice with patients who live in the city is to treat only one tonsil at a sitting.

In eight or ten days the patient comes back, the tonsil operated upon has from 50 to 75 per cent disappeared, and the other tonsil is treated. Both tonsils can, of course, be treated at one sitting and can be entirely removed with one treatment, but there will, of course, be greater reaction and the patient is more uncomfortable than when only one tonsil is treated at a time. I prefer giving four to six treatments to each tonsil, and they are removed with no great inconvenience. I have not had more than four or five patients who have gone to bed for a day, or who have had any temperature, or who have missed their three meals a day, or who have missed any time from school or business. We know from the experience of those who have been using diathermy for years just how much heat to use, and if you have a proper setting for your machine, we get an absolute meter reading so that we know just what heat we are producing. We know further that heat spreads about one-eighth of an inch from the needle in each direction, so you must keep away from the soft palate, the pillars, and all structures except the tonsil tissue; then you have pleasing success and your patients will be most grateful. I have never had a case of unusual edema of the surrounding tissues, no sloughing, positively no damage to the pillars, not a single ear complication, nor any other symptom more than a sore throat, no more severe than an ordinary tonsillitis, and in only a few exceptions (not more than three or four), was there a rise of temperature for more than a day, with none of the bad results that so frequently follow tonsillectomies, yet we secured the same good results as we should have when we shut off these sources of focal infection.

I would advise no one to attempt this method who has not seen someone perform the operation a number of times and learned the little tricks of technic, which are so great a factor in getting good results. At the present time I know of no university or medical school in this country where this experience can be had.

In conclusion, I will say that with local application of cocaine as described, and with proper technic, following the method of treating one tonsil at a sitting, making four to six treatments to each tonsil about eight days apart, you

will have nothing but success, with disappearance of the tonsil, with absolutely no danger to any other structure, and all objectionable features of tonsillectomy removed. Your patients will be free from their foci of infection and constitutional symptoms, and yet you have subjected them to nothing more serious than an occasional sore throat.

I want to enter a strong plea for a more careful study of each individual case, as I believe a great number of tonsils, especially in children, are being needlessly sacrificed. Warthin, the noted pathologist of Ann Arbor, says that 60 per cent of the tonsils sent to him for examination, after enucleation, were normal. I think the specialist should consult with the family physician as to the history of the case with all its symptoms, and that then only, after a careful inspection of the tonsil, which if found to be diseased, should it be condemned to the guillotine. After using electrocoagulation for three years, I am strongly for it and hope to see the day when it is accepted as the method of choice in all adult cases.

DISCUSSION

DR. FRANK J. NOVAK (Chicago, Ill.): The essayist stated that among the authorities who recommend this particular procedure are Portmann and Poyet of France. He also stated that they recommend this procedure in certain selected cases. I recall very distinctly when Dr. Portmann visited here in Chicago and came to me. I asked him whether electrodesiccation of the tonsil was a routine procedure, and he said, no, it was simply a procedure in very carefully selected cases. I had a communication from Dr. Clark of Philadelphia in which he made the same statement. In other words, Clark also desiccates only carefully selected cases. Dr. Dillinger has stated he makes it a routine procedure. In other words, this method has replaced the usual method of tonsillectomy as practiced almost universally.

One of the objections to tonsillectomy, as we know it, according to Dr. Dillinger, is the danger of lung abscess. He has quoted Chevalier Jackson. We all know that lung abscess follows tonsillectomy. I recall having seen five x-ray pictures of lung abscesses at the Municipal Tuberculosis Sanatorium in Chicago. Three of those having abscesses had within them pieces of tonsil wire which were aspirated at the time of operation. The fourth one had a piece of some sort of wire that I have never seen employed in any kind of tonsillectomy. Those were four cases of lung abscess due to foreign body aspiration at time of operation. We will grant there is a danger of lung abscess from tonsillectomy, but we must also remember that lung abscess forms only

when the epithelium of the respiratory tract has been damaged previously by some such infection as this. When the epithelium is damaged and the normal flow of fluid is interfered with, the individual is operated upon and blood is allowed to accumulate in the throat. The patient aspirates it; he has been prepared by his previous influenza and we may expect the lung abscess.

Either we should resort to electrocoagulation or improve the technic of the usual tonsil operation. All of you have seen, not only in clinics, but in private practice as well, a patient with a mouthful of mucus, or a mouthful of blood. The operator, using the light coming from the window, feels around at a distance and chops out a piece of tonsil. The patient aspirates this material. That is not good technic. If the throat is kept clean, if the blood is not allowed to accumulate, if secretions are promptly removed by suction, if the tonsil is removed rapidly and thoroughly, the danger of lung abscess is minimized.

What assurance have we that by the method of electrodesiccation we avoid this danger of lung abscess? What statistics are available? What statistics are being collected? This procedure is relatively a new one compared with the countless thousands of tonsillectomies that have been performed. The series that has been done under this method is almost insignificant. We have no statistics. We cannot say that by doing it in this manner and by this method, lung abscess does not occur. We do not know.

I have one objection to this method. A patient was brought to the Lake View Hospital here in Chicago, a doctor. He had been running a temperature of a septic type, the upper limit of 103 and 104, and then sub-normal. The man had a septicemia, and the thing had started as a giant infection. This man was a doctor and the internist who was treating him advised him to have the tonsils removed. Instead of having a tonsillectomy, he had his tonsils desiccated by a competent man. Following the desiccation, the temperature dropped almost to normal and stayed that way for a day or two, and then the curve up and down began until we saw him. The man was in desperate straits. He was very sick, and several physicians were called in consultation. The internist advised against any kind of operation because he thought the patient would not stand it. In spite of that we examined his throat and found a perfectly clean scar, a perfectly clean tonsil fossa, as fine and clean as any I had seen. At that time I thought I would have to change my opinion of electrodesiccation. In spite of that, we put a forcep up near the pole and pulled on it. There seemed to be a little bulge here. I dissected the upper portion of the scar and reflected it downward. Directly underneath, in the upper third, there was a mass of debris, which in section proved to be lymphoid tissue. The same thing was done on the other side, and again a mass was exposed. It was the mass that occupied the region that is occupied ordinarily by the large upper crypt of the tonsil.

When this had been removed the temperature again dropped, as it had dropped previously, some months

before, but in this case the temperature stayed down. The man made an uneventful recovery. I think this is a critical case. It illustrates the objection to this procedure which I made, I think, in this place a year ago. At that time I made a theoretical point of the fact that it is possible to seal in a crypt and not know it, and once sealed in, it is difficult to see that it has been sealed in. It is true with the ordinary tonsillectomy you may leave a piece of tonsil, but if you leave it you can see that it is left and you can remove it. By this procedure you delude yourself. You do not know what is underneath.

The type of tonsil which is most dangerous, the one we are most concerned about in the individual, is the type described by Dr. Galloway this morning. It is the type of small firm tonsil in which the crypt may have a denuded area of epithelium, and the blood vessels which are directly under this layer of epithelial cells are thrombotic. That is dangerous as a point of focal infection. If we attack such a tonsil by desiccation we do not know whether we are destroying the entire tonsil or whether we are destroying a particular crypt which may be responsible for all the symptoms.

DR. RAYMOND F. ELMER (Chicago, Ill.): In taking out tonsils, all methods have a good factor and a poor one. Some men who take out tonsils with the snare condemn the individual who takes it out with the guillotine. Some men who take out tonsils with electrocoagulation condemn those individuals who take it out by other surgical methods.

About four years ago we started to remove tonsils by electrocoagulation just as more of a hobby than anything else, because neither one of us was a specialist. Up to the present time we have taken out 1,460 pairs of tonsils.

As to the complications, lung abscesses and so forth, we have had none to our knowledge. We have had about ten cases of hemorrhage, that is hemorrhage that was fairly well severe. These cases were caused by the individual who about the second or third day, noting the slough in the back portion of his throat, would take some blunt instrument like the end of a tooth brush and attempt to remove some of the slough and, in that way, produce a severe bleeding.

The biggest complication we have in doing electrical desiccation of the tonsil is edema. There are three principles that we always adhere to in trying to reduce the edema of the tonsil. The first one is the amount of current used. If one short circuits his machine from the active pole to the meter, it reads about 2500 milliamperes and if at that time he lets his machine set at that amount, by the time he thrusts his needle into the tonsil, the meter will read about 350 to 400. If he doesn't use any more than that, it is evident that he will not develop a marked edema after coagulation. The other point is the infiltration of the anesthetic. Dr. Dillinger uses a local application which is very good. I use a one-half of 1 per cent solution of novocain, about 1 c. c. injected underneath the tonsil,

and in that way I don't get any fluid into the tonsils themselves.

The second point is to keep the anesthetic out of the tonsil, because if you don't get the same principle as follicular tonsillitis. The third principle is to stay away from the soft tissues, namely the anterior pillar and the posterior pillar.

We have had fifteen cases of hemophilia, that is where the coagulation of blood time was over fifteen minutes. None of those were cases of hemorrhages at any time. They were kept in the hospital.

In children we do not employ coagulation for obvious reasons. We have now limited ourselves to selected cases of nephritis, myocarditis or some type of circulatory or systemic disease. We have to re-coagulate about 10 per cent of the tonsils.

One contraindication for electrocoagulation is secondary syphilis. We have had three patients with secondary syphilis in whom we coagulated and noticed subsequently sloughing of the soft palate. In the first case we didn't know what was wrong. Under salvarsan therapy the condition cleared up. In our work we coagulate both tonsils at one sitting.

DR. THOMAS C. GALLOWAY (Evanston, Ill.): I have been interested in this subject of electrocoagulation for some year and one-half and I think I have gone at it rather disinterestedly, although I presume most nose and throat men are prejudiced in favor of the precise surgical removal by dissection, or with the instruments. I have attended all the clinics that I could around Chicago and watched the various workers, and I did not see any method that looked satisfactory to me until I saw Dr. Dillinger's work. I think it is the nearest approach to a surgical removal of a tonsil and the best technic that is available.

Dr. Dillinger, I don't believe, mentioned what I think is the essential point of his technic, and that is the use of a curved electrode which is hooked into the tonsil, turned toward the center of the tonsil. With that the tonsil is lifted away from the muscle bed and, not being in contact with the pillars or with the uvula or muscle bed, there is very little reaction produced.

I have run a series of cases in a clinic using the electrocoagulation on one side and a surgical dissection on the other, surgical dissection being done by the resident. Our cases are charity cases and it is therefore hard to follow them up. We have not considered the immediate reaction or the pain at time of operation. Our dissections are done with less pain than the surgical coagulation. I think you always have some discomfort, at least. The immediate reaction has been perhaps a little more after the dissection, but we have not gotten any of our tonsils out cleanly, out to a point where they would satisfy us as a surgical removal. It is hard to criticize the man's technic or any method in which you have not attained proficiency. You cannot tell whether it is your own fault or the fault of the method. I think there is a great deal of harm being done by some of the men who are selling anybody and

everybody an instrument and telling them they can go out and do tonsil work. It requires the same skill, the same visualization of the deeper relationship, the same appreciation of the importance of the pillars and the structures in the throat to do a coagulation as a surgical removal, and I think if the method is indiscriminately used, it is going to bring the method into disrepute. It has certain very great values.

For instance, it is a mistake to tell patients they can work immediately. We can tell our cases of clean tonsil dissections they can work immediately; they are not going to have any trouble. I think a lot of them would get away with it, however, I heard one man state his patients frequently had a temperature of 103 and 104 the day following operation, but that was no contra-indication for their carrying on their ordinary work. That is not quite honest and it will not help to popularize the method.

I wouldn't make the indications nearly as widely as Dr. Dillinger. Hemophilia is an absolute indication for this method. It is preferable to radium and x-ray. Nephritis, tuberculosis or myocarditis do not make a special indication for this method of surgical operation. I have taken out five tonsils in people over 70 with myocarditis without any shock.

The same thing about lung abscess. I don't think most of us who do our adults under local anesthesia run any more risk of aspiration in lung abscess than does the method with the surgical coagulation. We have with malignancies of the throat gotten some very bad aspiration results. Of course some lung abscesses come through the lymphatics. It seems to me that would be just as much of a factor in one method as the other.

There is a thing that isn't generally appreciated, and that is the importance of small fragments, not necessarily a buried fragment. Dr. Rhodes and Dr. Dick have done some work showing that very minute fragments may contain as many bacteria as a whole tonsil, and whatever method you are going to use, if you are doing it for systemic or distant effect, all fragments must come out. I don't think a method that removes most of the tonsil but leaves these fragments is satisfactory. It will clear up the patient's complaint of repeated tonsillitis just as the old tonsillotomy would do. I do think Dr. Dillinger has given us a very fine method where the surgical coagulation is indicated. I think it is valuable for flat, superficial fragments, and in the special cases.

Might I show a tonsil? This tonsil wasn't done by an operator of Dr. Dillinger's skill, but this is a slab through a tonsil coagulated three months ago. In the bottom of this is a crossed abscess. That is as bad a tonsil as if nothing had ever been done. It didn't do anything for the man's high blood pressure, nephritis and general toxemia.

DR. GREGG A. DILLINGER (Pittsburgh, Pa.): Yesterday afternoon at four o'clock a doctor came into my office. He weighed 325 pounds and had a little dyspnea.

He had his tonsils taken out by the method so ably defended by my friend, Dr. Novak, and yet I found what I thought was sufficient tonsil remaining to operate on him.

I would hate to condemn tonsillectomy on this case of the doctor in my office yesterday afternoon. Dr. Novak made a very fine speech on his one case which is his only principal objection to our method. I submit that is hardly fair. This fellow was just as sluggish an operator as the fellow who took out the tonsils of my friend, the doctor. That piece shouldn't have been left there. If the tonsil had been finished there would have been no scar tissue on the tonsil. The method itself is not responsible for some fellow doing a piece of work like that. Yesterday afternoon I put the needle into the doctor's tonsil and opened up a pus pocket, and pus ran down one-half inch over the tonsil.

I am not condemning tonsillectomy on the one patient yesterday afternoon. The same doctor brought a bleeder with him and he couldn't after two or three weeks get the coagulation time below fifteen minutes. As he was afraid to do this case, he brought the patient to my office for coagulation.

I was hoping Dr. Novak would give something from his own personal experience. I don't think it is fair to any method to do otherwise. I have been using

this almost three years, slowly developing my own technic to suit my own private practice, so that I can keep my patients at work every day, eating three meals, and having no serious consequences. I am satisfied with my results when I get through, and I want to tell you a lot of those cases are subjected to severe analysis and examination by many nose and throat men. I stated very plainly that Dr. Portmann and the committee that made the report to the Academy of Medicine, only used this method in selected cases. I didn't say it was their routine. It is my routine. I started to do tonsil work in 1897 in Vienna. That was thirty years ago. I have taken out a few tonsils in my time, and I am not getting so old yet that I can't operate when it is necessary, but I don't expect to ever operate on an adult nor do a tonsillectomy under novocain or ether. I am not selling this method to you; I was asked to explain what I am doing. I am so satisfied, I have no worries at night. I don't have scar tissue; I don't have dryness of the throat following operations; I don't have lung abscesses; I don't have to worry about hemorrhages and I don't have a lot of the objections we have taken up this afternoon in discussion. I know it's a perfectly safe, sane, easy method of removing the tonsil.

I couldn't conscientiously follow any other method now, because I would not myself want to be subjected to tonsillectomy if I could have electrocoagulation.

NEWER CONCEPT OF MANAGEMENT OF CARBUNCLE*

A. DAVID WILLMOTH, A.M., M.D.

LOUISVILLE

A carbuncle is understood to be a more or less circumscribed inflammatory area involving the deeper layer of the true skin and subcutaneous tissue down to the fascia. It is characterized by fibrinous exudation, multiple foci of necrosis and the tissue adjacent to each necrotic plug becoming gangrenous.

It differs from the ordinary furuncle, in that it is more extensive and spends its force more deeply and profoundly.

The bacterial invasion is the staphylococcus pyogenus aureus and streptococcus, which gain access to the tissues through the hair follicles and sweat glands and spread to the deeper structures by first involving the column of fatty tissue connected to the follicles. Each fatty column contains a sweat gland. An abrasion may also

be the atrium through which the infection find a port of entry.

Males have so far contributed nearly 100% of all cases of carbuncles involving the neck. This ratio is now changing, due to the present day custom of bobbed hair and shaving the neck. The act of shaving with the head leaned well forward thereby allowing a close cut of the hair, likewise permits the local irritation to the hair follicles with the admittance of infection with the ultimate end result of more neck carbuncles in the females.

Products of infection in one of these columns trying to gain an outlet, and not being able to escape to the sides, naturally goes the way of the least resistance, which is downward. Infection spreads as necrosis, breaking down the sides of the columns, opening interspaces, there-

*Read at sixth annual meeting, American College of Physical Therapy, Chicago, Nov. 3, 1927.

by allowing other interspaces to become involved, the products finding their way to the surface through these, until many openings are the result. These small pustules soon appear upon the surface which break and reveal the mouths of openings which lead through the skin to the sloughing tissue beneath. These multiple openings are characteristic of carbuncles and represent the paths of least resistance. The openings lead into deeper structures along the columnae adiposae by way of which the pus reaches the surface. Necrosis continually going on causes small openings to coalesce until many larger ones are present, each filled with pus and necrotic tissue until a honeycomb appearance is present. Superficial necrosis occurs relatively early because the spreading deep phlegmon soon cuts off the blood supply to the fat, superficial fascia and skin. The skin being the last to break down, while the process is going on beneath the surface, further infection takes place on the surface as more hair follicles become involved by secretion from the first, hence the two conditions going on *para passu*, causes one of the most dangerous types of infection that the surgeon is called to treat.

Many of the patients owe their condition to the *locus minoris resistentiae*, brought about by diabetes, and Bright's disease, and in many to old age as well, a large factor in the determination of the final outcome.

Thrombophlebitis is frequent and is one of the reasons why rapid spreading takes place to surrounding structures. Where the foci of infection are about the face or neck as they commonly are, septic clots in the facial, jugular, or ophthalmic veins, or even in the cerebral sinuses are not uncommon, and should always call for a guarded prognosis. The mortality in these regions is about 50%. So also is the danger great when the location is in a field richly supplied with lymphatics as around the shoulders, here abscesses in the lungs are not infrequent, and lucky is the case that escapes with only a pleurisy.

SYMPTOMS

Marked constitutional symptoms are present from the start in all cases. In many one or more chills will occur during the twenty-four hour

period, and septic fever is always present. Such marked symptoms, together with the hard indurated area surrounding the primary focus, with its purplish color, should enable us to make a diagnosis of carbuncle, and not the more simpler type of local infection known as boils or furuncles. If the patient is seen early, and close observations are made, delay will not so often occur in instituting active treatment. In these cases early active treatment is the only hope for sure and speedy relief. More especially is the diagnosis made easier when we have two or more openings in the sloughing area with creamy pus exuding.

The blood picture of those with the infection about the upper lip, is a very high leukocyte count.

Again when we have the infection about the shoulder or axilla and the patient begins to run high temperature, and at the same time the respirations run forty to fifty per minute we are sure that metastatic involvement has occurred, and along with the rapid breathing is the character of breathing. These patients breathe rapidly for several times then fix the lower chest, and use only the upper portion for respiration. Metastasis has occurred in the diaphragm and pleura, and the respirations stop at the height of inspiration and generally with a grunt. This cycle is again repeated after the patient has held his breath as long as he can.

We must not lose sight of the fact that metastasis may also occur by way of the circulation. Such patients as above described frequently develop septic endocarditis, or pericarditis. Involvement of any one or more of the joints may likewise take place at this time. The more metastasis we have and the more rapid it occurs, the more certain we can be that the type of infecting organism is the streptococcus.

One of the deceptive features of carbuncles is the appearance of the skin surrounding the original openings. The skin may only show a small area involved, say one inch wide and two inches long, with its many openings, but when the skin is opened the pus-filled fatty area may be four or five times this size and in depth much greater than has been suspected. The great resistance of the skin to infections and even the

necrosis that is taking place causes the undermining process that is always observed in operating on carbuncles. Carbuncles continue to spread laterally until nature is able to throw up a sufficient leukocyte resistance in the form of a cordon or barrier to further invasion, or the process is controlled by treatment.

In the management of these desperate cases, and they are desperate, unless properly handled, the writer has used for several years a method in quite a large number of cases that has proved entirely satisfactory. So far not a single mortality has occurred even in the extensive cases and in old people where this method has been followed. Having been unable to improve on the method heretofore described the liberty is taken to again give to the profession the treatment as carried out in our clinic in each and every case.

METHODS OF TREATMENT

Nowhere in surgery is delay fraught with more danger than in carbuncle. Patients should be under the constant observation of the physician and seen at least daily; those showing early extensive tissue involvement and those with facial involvement should if possible be placed in a hospital at once.

If the constitutional symptoms are not alarming, local and general treatment may be tried. If fever is high and frequent chills are present, with marked septic symptoms showing, no time should be lost in temporizing measures. The longer the delay the greater the necrotic area, the more septic the patient, and the higher the mortality. Generally speaking, the writer does not believe it is good surgery to wait to see if the condition will localize. It requires too long, and the results are far too uncertain to wait on vaccines, poultices, and topical applications. A carbuncle can seldom be aborted although injection of such agents as carbolic acid, are used into and around the infected area. Should the patient be unwilling to have active treatment instituted, he and the family should be made to clearly understand the risk taken, and the more extensive destruction of tissues required to obtain relief should natural efforts fail.

They should also understand that conditions may quickly arise that entirely preclude

further efforts to save life. If these salient points are made clear to those interested, little trouble is had in obtaining the consent for the surgeon to do as he thinks best. I am not unmindful that in a few, no amount of reasoning can persuade them to allow correct work to be undertaken. In these the use of such agents as vaccines, the water cooled ultraviolet lamp, hot antiseptic fomentations, which contain either a preparation of pepsin, or yeast to digest the slough, will hasten the removal of dead tissue to permit the field being kept clean. In these cases the use of sodium citrate in ten grain doses four times daily to liquify the secretion is very valuable.

Under the old plan of treatment by the cutting operation, which at best was not only bloody, but followed by severe shock and in many cases death, patients were not to be altogether blamed for taking the expectant plan of treatment. In many their chances were about as good as with any form of surgery. Since most cases come to surgery in some form, it is but fitting that attention be called to the various steps that have been made in attempting to best handle these dangerous cases. With full realization that radical removal was seldom advisable, the classical crucial incision followed by swabbing, with 95 per cent carbolic acid, followed with alcohol to counteract its destructive effects, was advised. This did not meet with the success that was hoped for, so the multiple incisions came into vogue. These secured some better results but were far short of satisfaction. Following these came the use of the Paquelin cautery. A thing that was apparently going to revolutionize the results formerly obtained. To those familiar with the difficulties of the above instrument further remarks are unnecessary. It worked fine at the instrument house, and by the time you had carried it to the hospital, for some unexplainable reason it simply would not perform.

Then came the electric cautery, always workable, or nearly so, fairly constant in heat, and to all intents and purposes seemed a real success. After many months of trial, this too, had its many disadvantages. Rapid cooling when most needed, heavy and cumbersome and unwieldy due to its being hot, and unhandy. It

did, however, render far more service than anything we had prior to that time.

The writer having had extensive experience with the d'Arsonval bipolar current in the treatment of cancer cases, its use in the removal of carbuncles naturally suggested itself.

The work could be done without anesthesia as a rule, save hyoscin, morphin and cactin, there was no cutting operation, hence no bleeding to staunch, no shock, and a shorter stay in the hospital; the further advantage being that there were no hot cauteries to handle or to become cool while in use, the heat being continuous, and the destruction of tissue being always under the control of the operator at all times. Any amount of tissue destruction could be had, depending on the amount of current used and the length of time of its application.

When it is definitely determined that a carbuncle is present, that is the proper time to institute radical measures for its immediate relief. Like acute appendicitis, the time to operate is when the patient is first seen, as the work will be less then and the patient's chances better than at any later period.

The technic is as follows: select the d'Arsonval terminals of the high frequency machine, because the voltage is low and the milliamperes high. If choice can be had, use a machine that does not oscillate more than a million times or less per second. Assuming that for some reason or reasons the patient should not or will not take either a local or general anæsthetic, and the amount of tissue is not too great, the area involved can be anesthetized by using the same type of current as will be used in operating.

Attach the dispersing electrode (so-called indifferent) of the machine to any part of the patient's body that is most convenient; or, what is a very good method, use the autocondensation handle and attach the indifferent cord of the machine to this, and tell the patient to grasp it with both hands, not so tightly as to cramp the hands, but firmly. This will give the patient something to do with his hands and prevent his taking hold of you, and is an easy way to make the desired connection.

To the other cord of the machine is attached the handle of the active electrode which is used with the needle point in destroying the pathology. Start with a very light current—just enough to make the so-called "feather spark"—allowing this to come in contact with the skin about one-fourth inch or a little more from the margin of the area to be destroyed.

By passing this in a circular manner around the carbuncle for three to five minutes and having your assistant gradually increasing the spark to the point of tolerance, at the same time increasing the speed of the revolutions, the entire area will be numbed, and without telling the patient, the needle is pushed into the infected tissue as deep as is necessary to reach the deepest points of infection and allowed to remain there, increasing the current if needed until the tissue is blanched white. The amount of current needed will usually be about 250 to 500 milliamperes and the time 20 to 30 seconds. When the tissue becomes white, the needle is removed and inserted into another adjoining area and the current reapplied until the tissue is again blanched. By repeating this procedure, the entire pathology can, in a few minutes, be entirely destroyed and only healthy tissue remain.

When all infected tissue is coagulated, the major portion can be removed at once with a large spoon curette, leaving only a healthy base. Any bleeding points are controlled by allowing the current to arc for one-half inch spark distance when all bleeding will instantly stop. The wound is now clean and ready to be dressed with plain sterile gauze. Pain will not be experienced after the treatment is over, for the reason that small terminal nerve endings are obtunded by the current.

If much destruction is going to be needed, the patient should be in a hospital, and given a full strength hyoscin morphin, cactin tablet, two and one-half hours before the expected time of the operation. This should be further augmented by the half strength tablet of the same, one-half hour preceding the operation. The patient usually comes to the operating table either in profound sleep, or if not, in that state of "twilight sleep" where he can converse with you,

while experiencing no pain, not remembering anything that happened at the time. Where ether anesthesia is used, great care must be exercised to prevent explosion by getting the ether can at safe distance before the treatment is begun. It is not good practice to assume your ability to absolutely prevent arcing, and start while the ether is being used, or the can nearby.

If the operation is about the face or neck, time must be allowed to get the ether vapor out of the patient's lungs and as a further precaution, lay a wet towel or gauze over the patient's face during the time the current is on. The operator can control any of these dangers, if experienced in the use of the current, by not allowing any sparking to occur on the surface. This is done by keeping the needle in the tissue during the entire time the current is on, and by keeping the needle clean and free from any charred accumulations at the top that is exposed for the first inch or two for contact. No sparking can occur from the portion of the needle that is covered with rubber tubing and away from the tissue.

Those cases being more extensive will require from 750 to 1250 milliamperes of current to work fast and avoid any hemorrhage, and should have the dispersing electrode applied to some portion of the body, either the thigh, back or abdomen. This indifferent electrode should be of block tin, six by eight inches in dimensions, and must always have round corners.

It should be kept in direct contact with the skin and should be thoroughly soaped or applied over a towel of several thicknesses which has been thoroughly wet with normal saline solution to make a perfect contact, and must be maintained in direct contact, either by an assistant holding it in contact with the skin, or a bandage applied over it, or sand bags laid on to hold it close to the surface. One layer of spongiopilin may also be used between the tin and the body surface. Unless perfect contact is maintained at all times, a severe burn will be produced by the current arcing across from the tin plate to the patient's body when the current is on.

The operator should always use a foot switch so that he may be in perfect control of

the current at all times. This insures instant application and likewise instant breaking of the contact when necessary. The machine should be grounded to a cold water pipe to take care of any stray currents. Remember you are using a current of potential danger both in voltage and milliamperage.

Start with the coagulation around the edges far enough away to be in fairly healthy tissue, which can be determined by the resistance of the structures to the entrance of the needle. Make a zone entirely around the carbuncle first, then go over all area involved and deep enough to destroy the dead structures. Then remove the excess as before with a large spoon curette, and if any droplets of pus make their appearance while curetting, again use the needle to coagulate deeper until healthy tissue is reached. Do not get too radical and destroy healthy structures.

The wound is dressed with dry dressing of gauze and the patient placed in bed.

If the slough that is going to occur, produces much odor, this can easily be cared for by the application of powdered sugar to the wound. The sugar should be moistened enough to form a paste and spread on gauze large enough to cover all the wound. The paste should be thick enough to make a smooth dressing when applied, and placed in direct contact with the wound. The dressing can be used exclusively if desired, or an oil dressing substituted when the wound has become perfectly clean and free from odor. The separation of the slough can be hastened by the use of pepsin which will digest all tissue destroyed by the current, leaving a clean granulating wound.

The electrocoagulation of these conditions is not only more rapid but much safer than surgical removal, there being no bleeding to annoy or cause shock. It seals all lymphatics, thereby preventing any further danger from metastasis, is painless after the work is done, has no mortality from shock of operation and leaves a smaller and more pliable scar. The scar can further be lessened and the healing process made more rapid, by the use of water cooled ultraviolet lamp, one to two minutes each day,

with open lamp at six inches distance. The use of peroxide to cleanse the wound will not only favor the cleansing process, but will act as a photosensitive agent enhancing the therapeutic action of the lamp.

A word of caution should be given in those cases where local anesthesia is used. Remem-

ber tissues infiltrated with fluid generate heat much more rapidly than normal tissues. At least one third less current should be used, or else by the generation of steam a much wider destruction of tissue will occur than was intended. Electrocoagulation in carbuncles so far surpasses the old treatment of knife or cautery as to make them obsolete.

SOME EXPERIENCES WITH THE USE OF RADIUM IN UROLOGY*

LEO C. DUBOIS, M.D.
CHICAGO

The use of radium assures painless and rapid cures in many serious disorders throughout the entire system. Especially is this true in disorders of the genito-urinary tract, where so often surgical intervention hastens rather than retards the progress of the disease.

Since radium first became an important factor in the treatment of tissue disorders its use in urology has added important chapters to the history of preventive as well as curative medicine. This is particularly true in bladder, posterior urethral and prostatic pathology. Medical records abound in cases of carcinoma of the bladder in which the growth has been permanently destroyed by radium therapy; of papillomata of the bladder and posterior urethra which have been cured, and in many instances potential carcinoma prevented by such treatment in the precancerous stage.

Alleviation, arrested progress, and, in early cases, permanent recovery of prostatic malignancy are recorded in many case histories throughout the civilized world. Young and Waters¹ state: "There is no field in medicine in which radium therapy gives more satisfactory results than in urology. Nowhere can radium be applied to deep-seated organs as accurately as by the cystoscopic and urethral and rectal applicators. Radium is valuable not only in malignant but also in benign conditions."

Medical literature is full of the action and effect of radium in destructive dosage on path-

ological and malignant tissue throughout the urological tract. So full, in fact, and so thoroughly known that further discussion of the use and effect of radium in destructive dosage seems superfluous.

So much has this phase been discussed that the effect of smaller dosage has been relegated to the background and what is, in my opinion, a most important phase of radium therapy has been neglected almost entirely; i.e., the use and effect of stimulating doses of radium on tissue in general, and particularly in urethral pathology.

The dermatologist has long known and employed small doses of radium in diseases of the skin, and the effect of radium on the skin has been studied rather thoroughly. The relative anatomy of the skin and mucous membrane is well known and it has been comparatively simple to apply experimentally the known reaction to medicinal doses of radium on the skin to the mucous membranes in general, and specifically to the membrane of the posterior urethra.

Various views regarding the mode of action of radiation upon living tissue have been put forth from time to time; as, for example, that it decomposes the lecithin present in the tissue cells, that its disintegration products act in an ingenious manner to produce the results obtained. This theory could not be substantiated by experimentation.

Another view is that of specific activation of intracellular enzymes. This, again, cannot be confirmed. It has been clearly established

*Read at sixth annual meeting, American College of Physical Therapy, Chicago, Nov. 3, 1927.

that radiation has a marked effect upon certain classes of colloids, among which are proteins and starch. Proteins undergo a marked diminution in viscosity and are more easily precipitated after radiation than before. In the case of starch, as shown by Colwell and Russ², this undergoes a partial change into soluble starch and dextrin.

It seems not improbable that certainly one of the effects of radiation is disturbance of the colloidal equilibrium of the cells, with consequent devitalization. If not carried too far the cell may recover, but if certain limits be exceeded the damage is irreparable and the intracellular enzymes may then come into play, their action being of a destructive character upon the devitalized cell protoplasm.

It has been demonstrated by numerous experimenters that radium rays affect tissue in two ways; first, by inflammatory reaction of varying degrees—on the skin, for example: first as simply erythema, then erythema plus desquamation; third, vesiculation with superficial ulceration and, finally, deep ulceration. Second, by a selective reaction of certain tissues of lowered vitality. Thus, its selective reaction on malignancy, often destroying tumor tissue while practically not affecting in the least degree the surrounding healthy cells. So, also, in smaller dosage, radium selects tissue which has had its normal vitality diminished by low-grade inflammatory reaction of long standing, by the effects of chronic congestion of a membrane and sub-membranous layers, on tissue which has been weakened by diffuse, soft infiltration, or the subsequent hard infiltration with its diminished vascular supply and inevitable malnutrition. This is an important point to remember in the treatment of membranous pathology.

Finally, the endothelial lining of the smaller blood vessels is remarkably sensitive to radiation, the cells becoming swollen, vacuolated and degenerated, with a tendency to proliferation into the lumen and ultimate obliteration. This, also, is an important point to remember.

Our attention was directed particularly to the use of stimulating doses of radium on membrane pathology in our search for some method of treating chronic passive congestion of the

posterior urethra which would give more definite and permanent results than the methods in vogue up to the present time. This condition has increased rapidly in importance to both physician and patient, and deserves much more intimate study than has been its fortune heretofore.

Chronic passive congestion of the posterior urethra exists after all long-standing pathology of either the anterior urethra, posterior urethra, prostate or seminal vesicles. The common causes of this end-result are:

1. Chronic anterior urethritis, either gonorrheal or catarrhal.
2. Stricture of the urethra.
3. Infection of Littre's glands.
4. Prostatitis or seminal vesiculitis.
5. Irritation condition of the urine.
6. Prolonged or ungratified sexual excitement or excessive venery.

In short, any condition bringing an increased blood supply to the posterior urethra which does not carry away that blood in a normal way or period of time. This condition is not dependent upon venereal disease. In fact, very often it is found in patients who have denied themselves normal sex relations, but have been unable to inhibit the natural impulses and so have acquired a congestion which has been unrelieved and which eventually develops the condition described.

Its peculiar anatomical structure, rich in capillary blood supply, rich in sensitive nerve terminals, the seat and center of response to sexual sensation, as well as its importance in the urinary reflex, makes the posterior urethra an area of vast importance. Comparatively slight disturbance of the vascular supply, the mucous membrane or the nerve endings in this area often develops into relatively serious disturbance of the proper functioning of the urinary and sexual complex.

Of these disturbances sexual impotence, relative or complete, is probably the most important. Young³ says: "The verumontanum is supplied with many blood vessels, lymphatics and nerve endings. During sexual excitement it becomes greatly congested, and this condition may become practically permanent in

certain cases of sexual neuroses, especially those associated with premature ejaculation. It is doubtful whether this is the cause or the result of the sexual abnormality. As the result of inflammation or long-continued treatment with caustics, the verumontanum may be converted into a mass of scar tissue. No constant relation between these conditions and sexual symptoms have been definitely established."

We wish to take issue with Young on this last sentence. In our study of the past five or six years we have found *many* cases of disturbance of sexual function due entirely to a pathological condition localized in the posterior urethra which, upon being relieved, allowed a return to normal, healthy sexual relations. The percentage of cases of impotence with purely physical, local etiology is not as low as is usually stated, and the diagnosis of cases of this type is of great importance because of the comparative ease of correction, with subsequent return of function.

The local pathology in chronic, passive congestion is of two general types:

1. The stage of increased activity. Of this stage Wolbarst⁴ says: "Soft infiltration is the most frequent lesion encountered. The mucosa is hyperemic, congested and bleeds easily on the slightest contact. The area is dark red, swollen and increased in size. It takes on a smooth appearance and becomes distorted in shape. It is quite customary to find the mucosa markedly swollen, and manifesting itself in the form of bullous edema, concentrated more or less and bleeding easily."

2. The stage of diminished activity. Of this stage the same author says⁵: "The posterior urethra is seriously altered in hard infiltration. The membranous region takes on a grayish-red, slightly yellowish color, its brilliant luster disappears and gives place to a dry and dull appearance. The epithelium desquamates freely, so that it may be denuded over a very considerable extent. Vegetations and polypi are frequently found."

SYMPTOMS

In conditions following venereal infections we have persistence of shreds, burning, fre-

quency, itching, and all the symptoms which are so familiar to urologists. In conditions which do not follow infection, as well as frequently in those that do, the most striking symptoms are related to sexual activity.

In the first stage we find increased sexual excitability, nocturnal emissions, premature ejaculation, all the symptoms of an increased irritability of the sexual center. As the condition becomes more chronic, as the pathology changes from the first stage to the second, we get the history of diminished libido, difficulty in getting an erection or inability to get a complete erection, increasing difficulty in having sexual intercourse and, finally, absolute loss of sexual power.

TREATMENT

When caused by remote disease conditions it is readily understood that such disorders must be cared for before attempting any form of local treatment in the posterior urethra, whether it be urethritis, stricture, prostatitis, seminal vesiculitis or anything else.

With the remote causes corrected there still remains the local condition which, regardless of etiology, is essentially responsible for the symptomatology, the chronic passive congestion of the posterior urethra.

If we recall the statements made a few minutes ago regarding the selective effect of radium on membrane whose local resistance has been lowered by chronic inflammation or congestion, and likewise the selective effect of radium on capillary endothelium, we can readily see the possibilities of stimulating doses of radium in this condition.

In determining the dosage to be used, experiments made with radium on various membranes and surfaces by other observers were taken into consideration. It has been found that 50 milligrams of radium, screened as we have used it and applied to the skin for one hour, shows practically no inflammatory reaction. The same dose applied to buccal or rectal mucosa reveals, on cross section of tissue examined from four to twelve days later, a slight low-grade inflammatory reaction. On the theory that the posterior urethra is covered by a membrane

somewhat more sensitive still, we decided on the dosage of 50 milligrams of radium, applied for one hour, as the proper amount to obtain the desired effect. In several cases 100 milligram hours have been used with no untoward effect.

METHOD OF TREATMENT

The 50 milligrams of radium, screened with 1.4 mm. of gold and 0.8 mm. of rubber, are placed in a sound-shaped posterior urethral applicator. After a local anesthetic has been left in the urethra for ten minutes the applicator is introduced into the urethra until the tip, with its radium content, rests in the posterior urethra. The applicator is then fixed and held in position for one hour, giving the patient 50 milligram hours of radium emanation. If proper anesthesia has been obtained, there is usually no complaint by the patient, except occasionally of slight spasm of the sphincter toward the close of the period. The patient is directed to have no sexual excitement for six weeks, and to return at the end of that time for examination.

Up to the present time some 60 patients have been treated by this method, most of whom had previously been treated by various other methods without improvement. Many were cases of long standing.

The results in this series have been highly satisfactory. Nearly all of the patients have reported back at various intervals, up to five years from the time of treatment. A large majority report a complete return of sexual function, and urethoscopic examination in these patients revealed, at the end of six weeks, a normal appearing posterior urethra and verumontanum. Repeated examinations at various later periods showed a continuance of this normal condition in most instances. Three cases required a second treatment with radium, two with satisfactory results following the second application, the third case being too recent to examine. Several cases required from one to four after treatments with silver nitrate to bring completely satisfactory results, but they reacted to this medication after the use of radium whereas before it had no apparent effect on the condition. Two patients did not return for re-examination and were lost track of.

We cannot be sure at present whether all these cases are permanent recoveries or are undergoing temporary improvement over comparatively long periods of time. We do know however, that over these long periods of time we have obtained results both symptomatically and anatomically which we have been unable to approach by means of any other kind of treatment.

PRECAUTIONS

In using radium some precautions must be taken:

1. If there are any remote causes for the local condition these must be remedied first. Otherwise, the result will be only temporary and the remote cause will produce a recurrence.

2. In the presence of infection, radium should not be used, as the stimulation produced causes an exacerbation of the inflammatory reaction.

3. Care must be taken that the radium rests in the posterior urethra and not at the neck of the bladder or too far forward. In the first instance a trigonitis will result, which is very annoying; in the second no beneficial effect will be obtained.

A careful differential diagnosis is essential. Radium is not a cure-all; it is not suitable for treatment except under the conditions and with the pathology mentioned. However, in the type of case under consideration, highly satisfactory results have been obtained, in many instances when other types of therapy have been unsatisfactory.

CONCLUSIONS

1. Radium has a selective effect on diseased or improperly nourished tissue, as well as on capillary endothelium.

2. Radium has been of special value in the treatment of both malignant and benign conditions of the genito-urinary tract.

3. Stimulating doses of radium have been used in a large number of cases of chronic passive congestion of the posterior urethra with highly satisfactory results.

104 South Michigan Avenue.

DISCUSSION

DR. GUSTAV KOLISCHER, (Chicago, Ill.): I would like to take up a few points in the paper of Dr. DuBois. I take exception to the statement that it is conceded by the majority of urologists that radium is very successful in treating malignancies of the genito-urinary tract. That is not so. On the contrary, certain methods of applying radium to malignant tumors of the prostate and bladder are absolutely harmful to the patients. I mention especially the so-called implantation of radium emanation needles into the tumor. These patients do not become cured, they become infected, they develop fistulas, and instead of dying one death they die a thousand deaths. I have seen a number of such cases, and it is hard to believe that we should have been so unfortunate as just to have seen these cases who went on and all the others became cured.

The fact is this: after a great many of these patients with malignant tumors of the bladder are treated by radium, their bladder is reduced to a little leathery cup so the suffering of the patient becomes so great that something has to be done, and in opening this bladder to furnish drainage of the urine, you have a difficult time finding a cavity at all, and even then, on account of the cicatricial condition, the patient suffers until finally he is released by death.

As to other statements made by similar authors that the verumontanum swells up during the time of sexual excitement, I would like to see the man who ever saw a verumontanum during erection. It is impossible to introduce a cystoscope or an endoscope under these conditions. How are you going to tell that the verumontanum is swollen? That is impossible.

I would like to take exception not to the reports of results. The doctor knows what he is talking about; he had them. But as to his argument that radium has a selective action on poorly nourished cells, it is just the opposite. Every radiologist will tell you that if results are accomplished by radiation, it doesn't make any difference whether your rays come from an x-ray or a radioactive substance, the results are far superior if previous to the application of rays you produce a hyperemia. Hyperemia means better nourished cells, and they succumb easier to the influence of radium. Consequently how can we make the statement that radium is a selective action on poorly nourished cells?

We have heard for a great many years about the stimulating effect of small doses of radium and small doses of x-rays. That is simply a theory, and a very poorly founded theory. Let me quote an instance. We know that, for instance, very severe fractures of the forearm are very favorably influenced by radiation. If the excess would stimulate the cells, things would get worse and not better, and small doses of x-rays would produce the effect. The explanation is very simple if you consider the conditions.

We know that lymph cells of any kind are very susceptible to x-rays. In this infiltration, nature, so

to speak, overshoots the mark. There are so many defensive cells, round cells, lymphocytes and so on, mobilized, that the blood supply of the lymphatic stream is choked off, there is no chance for repair. If by mild radiation we don't destroy anything but the highly susceptible cells, then the compression is relieved. If you get a highly congested nephritis with hypertension and you radiate the kidney, you get a relief. The anuria is changed into polyuria. Again the same thing. All these cells that hamper the circulation, block the glomeruli. Consequently what you usually consider stimulating effect is nothing else but the consequences of destruction and not of stimulation.

That the doctor got his results I don't doubt for a minute. It is highly probable that all his reports are well and alive. We know that radium will obliterate by destruction the endothelium of the capillaries. That is the reason we insert radium after operation in the uterus. It is very easy to explain. The reports and successes that he made should not be based on preconceived theories that are absolutely refuted by the facts.

DR. LEO C. DUBOIS (Chicago, Ill.): I am sorry I can't take the responsibility for some of the statements, for Hugh Young and Waters were the two principal offenders. The literature is extremely rich in observations opposite to the stand taken by Dr. Kolischer.

The phrase "stimulating doses" is probably poorly chosen. If I had been permitted a little more time to elaborate on the so-called stimulating effect I would have developed the point that the energy we use acts, according to my own theory, first, by destroying the superficial layer of cells, as Dr. Kolischer has well stated, and, secondarily by stimulating the growth of new tissue underneath. From that observation the term of "stimulating dosage" has developed and is somewhat misleading.

The importance of treatment by this type of radiation has yet to be determined because there have not been enough cases reported nor followed up. I do think, however, that it is a field in which we can benefit cases of the type which are very often overlooked or frequently mismanaged by routine urologic efforts.

REFERENCES

1. "Deep Roentgen Ray and Radium Therapy in Malignant Disease of the Genito-Urinary Tract," by Hugh H. Young, M. D., and Charles A. Waters, M. D. *The American Journal of Surgery*, February, 1927.
2. Colwell and Russ in "Radium X-Ray and the Living Cell," 2nd Ed., 1924.
3. Young, Hugh, "Practice of Urology," Vol. 1, Page 166, Par. 2. (Saunders) 1926.
4. Wolbarst Abr. L., "A Treatise on Cystoscopy and Urethroscopy," by Dr. Georges Luys. Translated and edited with additions by Wolbarst. Page 101, Par. 1. (C. V. Mosby Co.) 1918.
5. Wolbarst Abr. L. "Ibid." Page 106, Par. 4.

SINUSOIDAL CURRENTS—THEIR MECHANISM AND EFFECTS IN CONSTIPATION*

FREDERICK H. MORSE, M. D.
BOSTON

When a current of electricity passes through a conductor by the usually accepted theory from positive to negative pole, it produces certain physiological and chemical actions characteristic of the so-called galvanic current. When such a current is generated from cells, carbon and zinc elements, the current itself is smooth, continuous or constant, as one would wish to define it.

When a current of electricity of the same nature and having the same properties is generated at the power house from dynamos, the character of the current is variable, as may be determined by the oscillograph showing slight oscillations.

When a direct current is passing through a portion of the body, a sudden break in the current may cause a more or less painful shock, according to the strength of the current. If there is interposed in the circuit a resistance, or commonly called induction coil with a mechanical interrupter, properly constructed with platinum to prevent chemical action, it has been styled the faradic current. The latter is but little used now as the more recently devised alternating sinusoidal takes its place.

What induced men years ago to try to discover something better than the interrupted galvanic current was the fact that it had no penetration and it was superficial in its character.

Gollet of New York, Engelmann of St. Louis, Newman of New York and Hodginson of Providence, all devised forms of faradic coils which they called high tension coils. Instead of having a few feet of number 18 or 20 or 24 wire on the induction coil they had number 36 wire and sometimes as high as 10,000 interruptions per minute. That was called high tension faradic. It had a polarity showing the continuous current interrupted.

When an alternating current comes from the power house, it has no polarity, hence no chemical action, as the currents described.

When alternating current is put through a process of transformation, its voltage is increased to such an extent that the production of heat and light as in high frequency and x-ray also has its therapeutic place. When the direct current is so arranged into the construction of mechanism that the current instead of traversing a straight line, reverses the polarity at regular intervals, and when diagrammatically a curve instead of a straight line is seen in the path, it is called a sine wave. That becomes a true alternating sine current by constant reversal of the galvanic current and it may be rapid or it may be slow, it may be interrupted, and there are all sorts of variations which have no therapeutic value, but at the same time it is a sine wave.

When the mechanism is so arranged that the current of galvanism starting at the positive pole on its way to the negative pole, does not go below the straight line, but keeps above the line all the time, then it is a half of a sine wave and we call it a unidirectional galvanic sine.

When a current is also arranged by mechanism so rapid that the polarity effects cannot be detected, many thousands per minute or second, then we have an alternating current sine wave which has no polarity effect and all the value it has is when we can twist it around into the selective motions desired for the various therapeutic uses which we may wish. The last rough (blackboard demonstration) sketch is the alternating sine; and this is the galvanic sine, yet if this were pulled out as an accordian, long, it would be the same as the other. There is no difference in construction, except in shape, but there is difference in the therapeutic value, because there are certain polarity effects and chemical actions in galvanic sine, and none from the alternating sine wave.

Thirty-six years ago d'Arsonval in Paris gave this the name sinusoidal current because of the character of it, namely, a sine wave. The therapeutic value of the sine wave is much handicapped because of the fact that it changes polarity. I really don't think that at the present

*Read at sixth annual meeting, American College of Physical Therapy, Chicago, Nov. 3, 1927.

time it is considered of any real value. A galvanic current, as you know, has distinct factors as a galvanic current, both positive and negative, and if we wish to enhance the value of the galvanic current we use the sine wave because of the special property that we get from having a little mechanical effect thrown in with the current itself.

Any form of electricity, diathermy, or possibly the faradic, where we can throw in a motion to the current we already have, the added impulse of the waves of the current does give a more disturbing property if we are trying to treat indurations and conditions that we meet in the human body, like arthritis and so forth.

Let's see if we can't apply this to something definite. The impairment of normal peristalsis of the digestive tract leads to a condition which offhand is diagnosed as constipation, without regard oftentimes to etiology. Modern medicine with advanced means of diagnosis has established the fact that the terms rheumatism, arthritis, lumbago, and other forms of similar painful areas, often called neuritis, are but names of symptoms, the cause of which must be determined whether traumatic or infectious.

Constipation, or more accurately defined as obstipation, is not a disease but symptom, and yet a symptom of such importance that if the exact location or locations of the primary cause be undetermined or ignored, and treated symptomatically, usually by cathartics or even diet, it is not only more or less a continuous avoidable annoyance with indifferent results, but life is actually shortened.

As there are so many causes that directly or indirectly lead to chronic constipation, before any intelligent plan for relief or cure can be outlined, there are several important factors that must be taken into consideration before therapeutic methods are established. Patients will tell physicians that they do not remember when they did not have to use either cathartics or enema to insure daily evacuation of the bowels. Others will definitely declare that the trouble started following typhoid fever and other diseases or acute attack of ptomaine poisoning, indigestion and the like.

A common history of the causation of constipation is stomach trouble for years, followed by intestinal gas, recurrent pain and soreness in the right side of the abdomen, often followed by an operation for removal of the appendix after which the constipation was even more troublesome.

Mechanical obstructions within or without the bowel must always be considered, such as stricture, foreign bodies, gallstones, invagination, hernia, tumors, hypertrophy of the valves of the rectum, or fistulae, fissures, rectocele or cicatricial tissue following surgery of any part of the colon, especially the sigmoid and anal regions, or adhesive bands due to abdominal operations, particularly in gynecology.

That age and occupation have much to do in retarding proper bowel elimination is easily understood. Loss of tone of the abdominal muscles, due to the build of the individual, and the habitual wearing of tight clothes, especially belts commonly used by men, is another factor of no small consequence in helping produce a continuance of inertia from that source.

Nervous diseases, locomotor ataxia, lead poisoning, hysteria and the like, are not to be ignored when outlining a method of treatment.

Improper diet and irregular habits of making an attempt at bowel elimination are also among the causes.

It is often observed that when a patient has suffered a long time with intermittent or constant constipation, there begins to develop a condition of alternate constipation and diarrhea, as the patient describes it. Careful observation will often discover mucus in the stools, indicating a catarrhal inflammation in the colon, to be followed sooner or later by jelly-like matter, and the diagnosis made as "colitis" which may advance to an ulcerative form, then to a membranous, and in older subjects, malignancy is a very common result.

When the history of such cases is obtainable, combined with an x-ray of the colon, it will be found that the cecum has been distended due to a sharp angulation at the hepatic flexure for a long time, and that the toxic products from

Modern appliances for the use of the rapidly alternating sine current have made it possible to produce molecular gymnastics within the bowel that was not feasible where a gal—that region have been the direct cause of the colitis.

What the writer has said in this paper is practically what may be found in almost any book on the subject, and nearly all writers agree that a large majority of cases is due to intestinal atony, combined with loss of abdominal muscular ability to do its part in the expulsion process of defecation.

Observation by x-ray by bismuth or barium taken through the usually twenty-four hour process to determine the rate of progress through the digestive tract, verifies that which a physician can usually ascertain from the history of the case and by percussion, but rarely can it prove satisfactorily at what point the atony is most marked.

The too often diagnosis of gastropptosis and enteroptosis is not definite enough as a guide for treatment, either dietetic, medicinal or mechanical.

In this paper, dealing with the physical care of the subject, it is understood that diet and other measures are to be adopted as are indicated in individual cases.

In outlining a method for restoration of function—the location, shape and extent of the atonic (bowel) area must be determined to a nicety, and it is here that if the best work is to be done, an x-ray by barium enema, with a properly prepared bowel, is without question essential, as it saves time and prevents guesswork.

That the prolapsed colon, causing more or less of an angle at the hepatic flexure and consequent distended cecum, is the primary disturbance in the majority of cases, is an accepted fact, and it is here in the recurrent and relapsing forms of right side painful attacks, that so much uncalled for surgery has been done, because the surgeon has ignored the abnormal hepatic flexure angle described as the cause of the symptoms, namely, the lower end of the cecum being crowded against the crest of the ilium, causing localized pain and tenderness about the appendix.

In treating constipation by sine wave currents, alternating, please do not ignore the fact that the sigmoid, after having become distended, distorted and impacted for the long time, as I have already said, loses not only its motor, but sensory nerve response, and many people will ignore going to the toilet because they don't have the inclination but, if they did they might have a movement of the bowels. That is a strong indication for the use of rectal stimulation by whatever means you think best, no matter what other things you may do. That being ignored is the cause of so much failure in combating constipation.

From the foregoing statements, the writer must conclude, with the observation of many thousand cases, that the hepatic and sigmoid flexures must receive special attention and consideration, if one is to intelligently treat so-called constipation.

The same general rule that would apply to the restoration of defective muscle and neuron of the voluntary muscles, will apply to the involuntary. The invigoration required may be brought about directly from front to back through the abdominal walls, by the left side abdominal wall and by the rectum, and by the stimulation of the spinal nerve supply or in combination, as the individual case seems to demand.

If a rectal x-ray is not used to confirm a diagnosis and by examination and history of the case the sigmoid is at fault, whatever other conditions exist, rectal treatment, regardless of the patient's ideas, or the doctor's convenience or otherwise, must be carried out or failure to get results will too often happen.

The writer is frequently asked, not only by patients, but by physicians, how many treatments will it take to cure constipation. The only answer that can be given is to say that each case is a subject in itself, and that age, chronicity of the existing conditions, combined with the muscular ability of the abdomen, their faithfulness to treatments and diet, determine the rapidity of results. On the other hand, things being equal, two or three treatments weekly will usually begin to show improvement, which is recognized by the patient, who explains his condition of having less gas, more ability to expel bowel contents, with more nearly natural appearance of stool.

vanic interrupted or slow reversing galvanic current had to be depended upon, because of possible destructive galvanic action within the bowel.

Colonic flushing, alternating or combined in the treatment with wave current stimulation, is used by many, and is to be advised when office conveniences make it practical. Also the use of static wave currents, diathermy, the various forms of light treatments, especially the infrared, for its local relief of pain and soreness, and the general tonic effects of the ultraviolet and hydrotherapeutic methods, in conjunction with the local application to those important areas described—hepatic and sigmoid flexures.

Not every case is going to be relieved and cured as the physician and patient might wish,

but the methods outlined can be made to usually produce such a change in the patient's condition of general well-being, because the threatened kinks in the colon have been changed into curves.

Ofentimes the threatened malignancy in severe cases is not only deferred, but actually prevented. Therefore, we are justified in advising our patients to continue treatments, although at longer intervals, even after they feel sufficiently relieved to discontinue, so as to maintain what has been obtained and prevent recurrence.

The average patient past fifty years of age, who has been as they themselves consider cured, will frequently go back to their former method of living and cathartics and bring about a return of the original condition.

MEDICAL DIATHERMY*

FRANZ NAGELSCHMIDT, MED. DR.

BERLIN, GERMANY

I don't think that in this circle of learned physical therapists I need enter into the fundamental details of diathermy. I may state that whenever we apply high frequency currents of any kind, we cannot avoid diathermization, and we cannot produce any diathermic effects otherwise than by applying high frequency currents. The only certain and proved primary effect of these currents is the production of Joule heat. This heat differs very much from any other kind of heat that we were able to apply to our patients until now. Any hot compress, hot water application, hot air application, radiant heat or any other kind of heat strikes the skin and enters to a very small depth, you may say a few millimeters. By applying a high frequency current we are able to induce those electrical waves through the whole body, and everywhere where these waves encounter some living tissues they produce heat. This heat therefore is not comparable to the general effect formerly produced by applied heat, and its effect is decidedly different and new. In fact, you cannot expect that the effects which you produce with the old methods of heat production, the common methods, are equal to the effects produced by diathermic heat. For instance, if you apply heat in the case

of some internal inflammation, for example some gynecological condition, the common heat will warm the skin and produce a hyperemia in the skin, while in the depths there will be evidence of an anemic state. If you apply diathermy in the same case, you will not only warm the skin, but you will also warm the tissues clear through between the two electrodes to its greatest depth. The result will be a through and through hyperemia. Deeply situated inflammations in the acute stage react badly to diathermy, whereas they are decidedly benefited when outside heat is applied. This will show you the principle of the diathermic action in some ways.

In the short time at my disposal it would take too long to describe the production of a diathermic current. I may say, however, that we are able, by making variations in the electrodes we use, in the size and kind, and by varying the place where we apply the electrodes, also by varying the intensity of the current, to produce different actions, even opposite actions inside the body. I may call your attention to some special characteristics of high frequency currents. If you apply a galvanic current to any part of the body between two electrodes, the current will not pass straight from one electrode to the other. You can prove this in an

*Address delivered at fifth annual meeting, American College of Physical Therapy, Chicago, Nov., 1926.

experimental way by taking colored matters, i.e., gelatine which changes its color by ionization, and by placing the electrodes far apart you will get a change of color in an irregular path between the two electrodes. This is different with high frequency current. The high frequency currents are the only electric energies we know of which really go practically on a straight line from one electrode to the other. This is a very important feature because it enables us to direct our treatment just to the organ where we want to apply it. On the other hand, it means certain difficulty for we must know well our anatomic structure and the site of the disease in order to obtain best results.

For instance, if you want to treat a heart you must place the electrodes anteroposteriorly over the site of the cardium, and not laterally or diagonally.

There is another difference between high frequency currents and ordinary currents. Ordinary currents find very high resistance in the skin and very low resistance inside the body, because the body is practically composed of a salt solution which conducts very readily. After passing the skin, conditions change for the ordinary current very much. Diathermy and high frequency currents encounter less difficulty in their passage between skin and other tissues. There is some difference which we may use for medical and curative purposes, but it is not so great that it alters the effect of the current as the difference between skin and other tissues does for ordinary currents.

What are the physiological actions produced by diathermy? I have stated that the only essential and profitable effect of high frequency currents is the production of heat. I have not been able to prove that there would be any other effect if we apply pure high frequency waves. Of course, if we apply sparks or condenser discharge, we then have no pure waves before us; we have then the action of sparks combined with the action of ozone, of nitric acid, and the action of the condenser discharge. That means that we encounter different actions which show, for example chemical decompositions. The high frequency current in itself does not show any chemical decomposition. High frequency current enters the body without causing any sensitive irritation except the feeling of warmth which can be in some cases so slight that patients do not notice it, or the heat can be

raised to such an intensity for instance in surgical diathermy, that tissue is coagulated. This primary effect of heating the tissue has in consequence a great number of secondary, tertiary and other effects. The chief secondary effect is the production of an arterial hyperemia, a capillary hyperemia.

Beside those effects mentioned there is a very marked action upon sensation, like a warmth everywhere which soothes and is pain allaying. We observe in the application of diathermy a very marked effect on the symptom pain, but not on all pains. Pains of an acute inflammatory character are not improved and you may presume in advance that diathermy is contra-indicated in any acute inflammation except gonorrhea and pneumonia. I cannot tell you why, but those two diseases are fit for treatment, even in an acute stage.

The physiologic effect of diathermy is not only local but also systemic and general. We observe, for instance after local treatment a rise in temperature of the whole body; we observe improvement of the local state by virtue of changes and improvement of the local circulation, as well as its influence on the entire circulation. We benefit the patient by raising the temperature of the blood. That causes changes and improvement of the local circulation, as well as its influence on the entire circulation. We benefit the patient by raising the temperature of the blood. That causes changes in the function of many organs, for example you know that a rise of temperature in any living tissue always means an increase of its function, and thus by raising the temperature first locally, we raise the temperature of all of the blood. The blood, therefore, transports the heat to all parts of the body and entering into the glands, for instance, increases the function of the glands; entering into the endocrinal organs increases the function of these organs; entering into the nervous system it stimulates or acts in some way on the nervous system and on the central organs. You can therefore obtain general effects from local application and local effects from general application.

It would be impossible in one lecture or in many lectures to expatiate on all of the effects one can produce in the different organs of the body by altering their function, by doing nothing more than inducing a higher temperature. I may state that French physicians have tried

to recommend diathermy to replace food; in fact, inducing an energy from the outside in the form of pure warmth without any toxic effect means inducing new energy into the body. If we take food and metabolize it we will only produce heat. Bergonie thought it would be possible to replace food by diathermy. I think that speculation goes too far. Food can be replaced by diathermy in some regards; it can replace, so far as it is used inside the body for the production of heat, the heat necessary to keep the temperature of the body at our constant normal temperature, but you could never replace the food which the body uses by decomposing the tissues. I do not think that diathermy can ever be used in replacing food, in the sense of Bergonie.

If we look at some physiological effects on special organs, I call your attention, for instance to the circulation. If you take an animal, a rabbit or a dog, and apply diathermy to the heart, you can observe that the number of pulsations of the heart is tremendously increased, much more than can be increased by any other method. We do not possess any medicant or any poison that would double the heart beat of an animal like I proved twenty years ago on a rabbit for instance. We can really double the pulsations of the heart with diathermy.

When treatment is stopped we would be justified to conceive that the heart would be very tired from the tremendous work performed by it, but nothing of that kind follows. The heart is not tired, it merely takes up a slower pulsation than before, and the amplitude of the pulsation increases. That means that the heart has performed this strong and tremendous work by using not its own reserve material inside the heart or those applied to the heart by the circulation, but it has accomplished it by using the strange energy introduced into the heart by our diathermy application. The action becomes slower and the amplitude greater, or what we call the amount of blood emitted by the heart at every contraction is increased. That indicates that the heart muscle has been strengthened, and has become even stronger than it was before.

This experiment shows that we can make use of diathermy with good results in heart diseases.

Now regarding the superficial lesions or superficial circulation. The application of high frequency currents can be affected in different ways and with different actions. For instance if you have a patient with some venous trouble (you can show it on an animal too). A good effect can never be obtained by applying plate electrodes to a venous system, because it reacts favorably to another kind of application. There you must use condenser electrodes like I am going to demonstrate tonight. If you want to act on the capillary circulation or on the circulation of the small or big arteries, then the plate application will be desired. If you want to act on the whole circulation, then you must use general applications of diathermy or by local stimulation of the heart, and in this manner work on the circulation.

In another experiment about twenty years ago I showed the action of diathermy on a certain gland. I had an opportunity at Battle Creek last week, to perform it once more. Professor Buluoff was kind enough to place a dog at my disposal for experiment in a lecture at Battle Creek. This dog had a salivary fistula for three years. I shaved the back of the head of the dog and the forehead between the eyes. I applied two electrodes, the greater one in front and a smaller one in the back, over the region of the medulla oblongata. I chose a time when the dog had not eaten for some hours and no saliva production was present. A little glass was applied to the opening of the gland at the fistula and we saw that not a drop of saliva was produced in the preparation of the experiment or during the experiment. I heated the medulla oblongata without touching the salivary glands at all by diathermy. The electrodes were applied so no current could go through the glands. I instructed to have the current continued for ten minutes. About nine minutes, or between the ninth and tenth, the gland began to produce saliva, because the center of this gland had been heated in the brain and in an indirect way produced secretion of the gland.

Of course, we could awaken the secretion of the salivary gland too by directly applying diathermy to the gland, but it is very important to show that action on the brain or on the part of the brain controlled the gland. By irritating

a center, a very high up center, we can increase the function of a removed gland. This experiment shows that we may apply diathermy to all diseases where we want to stimulate the function of glands. It means that we can apply diathermy with good results in all organs where glands sometimes lose their function. It means that not only can we influence salivary glands and sweat glands but also parenchymatous organs like the liver, the pancreas, the spleen, the kidneys, the thyroid, etc.

You understand now what a vast field of application we have in all kinds of medical cases if we know that we can increase by a simple diathermy application the function of a gland. Furthermore, if we give insulin, for instance, it acts in replacing the function of the pancreas, but if you stop insulin, the action stops, too. If you apply diathermy to a gland, you raise the function of that gland and if you stop diathermy, it will function for some time before it will stop and go back to its disturbed state. If you do it several times, you produce more than a mere stimulation of a gland, you produce, beside the stimulation of the gland, inside the gland and around the gland a hyperemia, an active arterial hyperemia. By producing this hyperemia you increase the living intensity of this gland, and you do more than that, you warm every cell of the gland. We know now that by raising the temperature of any living cell we increase not only the metabolism of the cell, which means in this case the secretion, but we increase the vitality; cells divide quicker, are renewed quicker, grow quicker, and are produced quicker. Thus you can expect that by a series of such treatments you will not only for some time improve the action of the organ, but you will have a real curative effect and will for a long time, perhaps during the whole lifetime, reduce this organ to its normal function. We can therefore speak not only of symptomatic effects but even of curative effects, and that is what makes this treatment so very important.

The same is also true with parenchymatous organs like the liver and kidney, and until now we have not had any treatment at our disposal by which we could cure cirrhosis of epithelial organs. If active cells have been replaced by connective tissue, we have no means to produce

this active tissue and to have it overcome the connecting tissue which replaces it. All this has changed since we have made use of diathermy. You can prove by a gall fistula that the liver secretes more gall after diathermy treatment, and not only secretes more gall but secretes real gall. I mean gall that is not diluted by filtration. The same is true about the kidney. If you treat a patient whose kidneys do not produce enough urine in Bright's disease in some stage, you can show by a prolonged treatment, and by continuous control of the secreted urine, that the amount of urine increases slowly although not equally. You will always see periods of intermission or up and down waves. The specific weight remains at the same height, even if the amount of the urine produced is much increased. That proves again that it is not a water filtration but a real secretion of the active organ.

In the presence of albumin we find cells; epithelial cells, renal cells, blood corpuscles, and cylinders. When diathermy is applied to such a kidney you will observe that after the first treatments more cells are secreted. You may now believe that means the patient has perhaps become worse. It must certainly appear that way. By this hyperemia and by this new life induced into the organ, all cells which ought to be secreted slowly in some places are now excreted at one time, so to speak, and you observe an apparent aggravation of the case in the first few days following treatment. Soon, however, the patient improves and after six or eight weeks of daily treatment, you notice a very definite improvement of the patient and observe after a few days treatment that the symptoms of intoxication have stopped. That action of diathermy is nothing else but the primitive hyperemia produced in the kidney. I could give you examples for all other parenchymatous organs too, but it would lead be too far afield.

I may now direct your attention to some of its indications. Let us begin again with circulatory disorders. First permit me to call your attention to some peripheral troubles. You all visualize those cases where patients have a marked arteriosclerosis in one limb. Circulation is very poor, the color is blue and white, the nails don't grow. There are thick epithelial and corneal layers on the sole of the foot and

severe pain occurs the very moment the patient attempts to take some steps. After a few steps he must stop. I have seen over seven cases like that which I described who were about to have amputations performed because the pains were so severe. They had to take morphin and narcotics day and night. Even in the severest cases you can get improvement very quickly by a certain technic of diathermy application. You see even during the first treatment, if it is rightly applied, the new arterially colored capillary circulation. After some treatments all pain is gone and sufficient color and circulation restored.

Parallel to a case like that is a disease which we call real angina pectoris. You know it is one of the most dangerous of heart diseases, and many patients die during an attack. Just as in the case of the foot, the blood supply has been stopped by arteriosclerotic changes in the coronary arteries of the heart. The blood supply to the heart is stopped, so much so that there is a strain on the body, and the heart can not do the necessary work to overcome that strain. It stops, tremendous pain occurs, the patient lies down, the face is pale and covered with cold sweat, the expression is anxious and fearful, he doesn't dare to move or even breathe. The effect of diathermy is dramatic. You apply your electrodes and in one minute you see the first deep breathing of the patient. The face becomes relaxed and he feels as though he were freed of many pounds of weight on his chest. The danger has gone and he may never again have a severe attack after that one treatment. In some cases you have to repeat the treatment for some time. In others, you have to treat them for years. I do not know of any other medicament or of any other method which would be able to cut off so severe an attack in so very few moments of application as with diathermy.

Many other circulatory disorders fall within the indicated range of diathermy. But let us leave this and go to some other field. I could speak at great length about lung diseases. I will only pick out some cases of asthma where one can apply diathermy with very good results. If it is a nervous asthma or a real bronchial asthma, the treatment is the same. Some cases react well to the treatment immediately while others do not. Asthma is today considered as a reflex rather than a disease of the lung *per se*. It can be

caused from the lungs and bronchi just as well as it can be produced from the nose, uterus or any other organ. Thus you will understand that you cannot count the results where asthma has been cured by diathermy if you apply the treatment just to the chest. You must have a diagnosis of the case and attempt to find out where the reflex is produced, and then apply treatment to that place.

Another important indication is pneumonia. Indeed every case of pneumonia in any stage ought to be treated immediately by diathermy. We do not always see a crisis in the next few hours, but we have seen crises occur ten or twelve hours after treatment. Generally the crisis occurs in the form of a little drop in temperature after treatment with diathermy, and the disease takes a very much shortened course. Not only is the disease cured and improved by diathermy but from the very first the patient is much relieved, because you treat the lung and influence indirectly the heart and the entire circulation. You therefore decongest the heart and the circulation of the lung. The patient can breathe better, his heart is stimulated and tonified, and the whole state is improved after a few treatments.

Pleuritis is another indication, but let us discuss another disease. I spoke of the kidney, of Bright's disease already, and I may state that the application of diathermy to a kidney in the state of chronic inflammation means practically the same as decapsulation. The decapsulation of the kidney means nothing less than relieving the kidney of an enormous pressure, to produce a relatively normal circulation. Diathermy application from the outside is all that is necessary to produce the same effect as a decapsulation, decongest the organ, and reproduce a good, healthy arterial circulation.

I testify its beneficial effect on the pancreas in diabetes, the thyroid treatment for myxedema or for hypothyroidism; its value where too little adrenalin is produced, the treatment of the suprarenal glands, etc.

In conclusion I recommend the use of diathermy to you and suggest intense study of this agency. It has untold possibilities and its correct application will benefit a host of conditions that at the present time cannot be reached by orthodox measures.

SECONDARY ANEMIA—ITS TREATMENT*

JEAN JONGEWAARD, M. D.

IOWA STATE COLLEGE
AMES, IOWA

One of the problems which confronts the staff of a college health service is that of treating secondary anemia. About two-thirds of the girls coming to the clinic show anemia, the point of hemoglobin ranging from 50 to 70.

While this condition does not mean that there is in all cases a definite cause such as infected tonsils, infected teeth, frequent colds or menstrual difficulties, still it does suggest that these girls are struggling with some physical difficulty which is keeping the hemoglobin content of their blood low and their physical condition below par.

Usually the first and only symptom complained of is a lack of energy. When a girl comes to the clinic, in answer to the question, "What is the trouble?" she will say: "I don't know; I'm just tired all of the time. I haven't any pep and I can't study because I haven't the energy. I wondered if you could give me a tonic."

We examine the girl to determine the condition of her body, taking her weight, temperature and pulse rate, looking at her nose and throat, going over her heart and lungs with a stethoscope, and sending her to our dentist to have her teeth examined. Routinely we have the urine and blood analyzed. In half of the cases there are no positive physical or laboratory findings, with the exception of the blood count, which comes back very much as follows: Hemoglobin, 60; red blood cells, 3,100,000; leukocytes, 8,000. Then we know that we have another case of secondary anemia to deal with.

Dr. Clifford Allbutt, an English physician, holds the view that chlorosis, this type of anemia, is a part and parcel of the changes that occur in a woman at puberty. He regards every girl as potentially chlorotic, and thinks that perhaps none pass through womanhood without some phase of the disorder showing.

Dr. Lloyd Jones, another English physician, suggests that the immediate cause may be pro-

fusion—a toxic excess—of an internal secretion of the sexual glands.

The general consensus of opinion among most physicians, however, is that anemia, except when caused by some definite disease, is due to a lack of iron content in the food together with a lack of sunshine. A great many physicians hold that the lack of sunshine is even a greater factor than the lack of iron content in the food. It is true that there seems to be a very close analogy of the one factor to the other, in their relationship to the hemoglobin content in the blood.

The logical treatment of anemia, therefore, is administering iron in some form and seeing that the patient is getting plenty of sunshine and the last is just as important as the first.

The girls at the college are situated a bit differently, perhaps, than private patients are, in that their hours and food are planned for them and the treatment which is prescribed must be done with this in mind. The easiest thing to do would be to give the girl the tonic which she is so sure she is in need of, in the form of the old, time-honoured Bland's pills or I. Q. and S. However, in the light of the wide research and experimentation which has been done with iron in the various forms of drugs, no doctor of today would feel justified in prescribing these drugs, trusting them to bring results.

In all cases we urge the girls to drink milk and to eat largely of those foods which contain iron, to go to bed early and to be out of doors as much as possible. We know, however, that the girls find some difficulty in making these arrangements, especially as to food—if she wants more than a glass of milk—which is the usual amount served in a day at the halls, she must order it and pay for it over and above the usual five dollars weekly board money, and many girls feel that they cannot afford to do this or to be bothered with it. The food which is served at the halls is good average food, but it is not

*Read at annual meeting Iowa Radiological and Physical Therapy Association, Feb. 22, 1928.

planned with a high iron content in mind. According to the rules of the college every girl who does not live at home or at a sorority house or at a home where she works for her board and room, must eat at the hall unless for some special reason she is given permission to eat elsewhere. At the hospital we have a limited serving capacity, and it is obvious that all of the students suffering from anemia could not be given permission to have their meals at the hospital, neither would it be wise to give the girls permission to eat at the various restaurants and cafes, because the food served at the halls is better than that which the girls would choose or be able to get outside.

As to the sunshine treatment. The students spend most of their morning and afternoon hours, when sunshine is at its fullest and best, in classrooms and laboratories, or in studying at the library or in their rooms, being out of doors only as they walk from the halls to the various buildings.

How then are we to treat anemia in student patients? Right here is where physical therapy steps in and proves its worth.

Dr. Edwards, head of our student health service and hygiene department, realizing the value of this form of treatment and the advantages it has in the more or less peculiar situation of student health work, has brought our physical therapy department up to a very high degree of efficiency.

We have three air cooled quartz lamps and all three of them are in use most of the time. We send the girls to our physical therapy department, and while they rest on cots, in the individual rooms provided, the ultraviolet rays very perceptibly and surely build up the blood, increasing the hemoglobin to a marked degree in from four to eight weeks time.

Mrs. Moore, our technician, has very kindly tabulated the average in 36 cases which have been under this treatment and these averages show some gratifying results. A few of these cases are shown where marked results were obtained.

On October 13th one of the girls had a hemoglobin of sixty with a correspondingly low

red count. On the 20th of November her hemoglobin was 68. On the 16th of December, 76, and in January the last time tested, it had reached 80. Another showed hemoglobin of 50 on the 26th of October, with a red count of 2,970,000. On the 17th of November it was 75. On the 16th of December it had reached 80. Usually the treatment begins with one or two minutes of exposure of the entire body under the lamp, and the time is increased one minute daily until at the end of three or four weeks an exposure of fifteen minutes to each side of the body, is given. At this point when the hemoglobin has increased, treatments are stopped, to be resumed after a rest period of one or two weeks.

During this rest period we find that the hemoglobin drops in almost every case, but when the treatments are again begun, we find that the hemoglobin climbs up quickly and in most cases remains stable.

Then too, we find that the girls enjoy the treatments. They like the little rest periods, they are very much interested in following up their improvement, and the mental reaction, the psychology of these treatments is even better than that of a "tonic." They actually feel themselves getting better.

We were questioned recently as to the value of ultraviolet ray treatment over that of iron given intravenously. For a period of eight weeks following the discussion we gave iron intravenously to six patients. The average number of treatments given was twelve, some of the patients failing to come for their twice-a-week treatments. The tabulated averages show the results. Previous to this time, iron citrate had been given subcutaneously but had been discontinued because of the severe local reactions. The results were not satisfactory and did not warrant continuing the treatments. The form of iron used in the intravenous work was iron-arsenite, iron citrate and iron cacodylate. These patients were on ordinary diet, but most of them were instructors in the college and could of course choose their foods.

In the intravenous treatment one must, of course, exercise care in the technic, and the

thought of having a needle thrust through the skin twice weekly is not nearly as pleasant as that of coming to the hospital simply to rest while lying down and letting the body "drink in sunshine" as one girl expressed it.

The lack of desired results does not justify us in continuing the treatment at the hospital.

Although our capacity is limited as to the number of patients we can take into the hospital for special diets, we have been doing some work along that line with good results.

In the case of one patient who had the full eight weeks of treatment receiving one ampule of iron cacodylate, there was no gain whatever under the intravenous iron treatment and it was not feasible to give her ultraviolet light treatments, so I decided to have her come to the hospital for her meals, putting her on a diet which was high in caloric value and rich in foods containing iron.

She has been on this diet having her lunches and dinners at the hospital, and has made a splendid gain in hemoglobin in the five weeks she has been on the diet. When she began her diet her hemoglobin was 55. At the last reading, on the 3rd of May is was 73. She

has also made a gain in weight, is looking better and feeling better.

Recently, some two weeks ago, we made arrangements to have three girls whose hemoglobin was persistently low, put on a special diet in which liver is the principal feature, served three times a day, together with other foods rich in iron, and high in calories, to try to raise their hemoglobin. These girls had all been under the quartz lamp treatment, and were practically the only ones of the 36 cases above mentioned who did not make some stable gain. The time has been too short to arrive at any definite conclusions, but every one of them has made a definite gain. They are still receiving ultraviolet light treatment, and it may be that with the two we will arrive at some splendid results.

In summarizing, I would say, that although our work has not been very extensive, I believe that we may very definitely give first place to ultraviolet light in the treatment of secondary anemia, with food treatment a close second.

A combination of the two it seems to me is ideal, since it is very evidently true from other studies that sunshine is part of nature's mechanism for promoting the assimilation of iron in foods.

AVERAGES IN ULTRA VIOLET LIGHT TREATMENTS FOR ANEMIA— STUDY THIRTY-SIX CASES

Hgb. Start	Hgb. Finish	R. B. C. Start	R. B. C. Finish	No. of Treatments	Time
63	78.8	3,651,000	4,316,000	33	6 weeks
Gain 15.3		Gain 665,000			

AVERAGES IN INTRAVENOUS IRON TREATMENTS—SIX CASES

59.5	61.4	3,109,000	3,833,000	12	8 weeks
Gain 1.9		Gain 724,000			

AVERAGES IN FOOD TREATMENTS—FIVE CASES

54.04	65.5	3,201,000	3,610,000	TWICE DAILY	4 weeks
Gain 11.45		Gain 409,000			

EDITORIAL

ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

SHOULD PHYSICAL THERAPY BE HOSPITAL CONTROLLED

Physical therapy became duly recognized as an essential factor in medical treatment during the World War. Since then its rational application has grown in importance. The Council of Physical Therapy has been established by the American Medical Association. Physicians are realizing that the employment of the various physical agents is almost a necessity in medical practice. Bombarded by the extravagant claims of the manufacturers of physical therapy apparatus; reminded of the many harmful results experienced by innocent patients at the hand of the unscrupulous so-called "physio-therapist;" and unable to glean the real facts from the mass of printed matter on physical therapy subjects spread far and wide, it is most difficult for the average physician to determine the real value of this medical specialty.

The hospital which desires to offer adequate medical service to its community faces the problem of maintaining and furnishing efficient physical therapy treatment. Just as the x-ray department or the clinical laboratory are necessary for diagnostic procedures, so the indicated use of such physical agents as water, light, heat, electricity, and exercise are essential adjuncts in the treatment of a host of medical and surgical conditions. If such a hospital service is available to the in- and out-patients and referred patients of the community physicians, less loose and more adequate treatment could be given patients.

A department of physical therapy should be governed in accordance with the standard and specifications set forth by the Council of Physical Therapy. The equipment should be useful and purposeful. Expensive and unscientific apparatus has proved the loadstone of many un-

successful ventures in maintaining this service. The staff must be trained to intelligently comprehend the treatment prescribed by a regularly licensed physician and adequately administer it. Concise, intelligent records must be kept, showing the exact data essential in administering treatment. The record is the backbone of the work. Where else could records be dependable and safe guarded. It is the basis upon which scientific determinations on the value of physical therapy procedures may be established.

The department must be directly under the supervision of a qualified physician. A man with a good medical and surgical foundation; an intimate mechanical knowledge of the muscular and osseous structures; the real action of the physical agents, with ability to apply any one to produce a desired effect. He must be familiar with the best established procedures—not an enthusiast on a certain agent, but reasonable and capable of weighing the justness of the physical therapy treatment as to the benefit of the patient. He must direct, supervise, teach and administrate. The hospital looks to him for a successful financing of the service; the physician comes to him for advice and selection of physical therapeutics which will be beneficial to his patient.

The stumbling block against which a hospital delays instituting a physical therapy service is extensive equipment and excessive cost of maintenance. A private concern makes a handsome profit because the equipment is used to make money. A hospital service is used to assist in curing patients. It is possible through wise selection of equipment, equitable charges for service, and judicious administration of the director to serve clinic and private patients efficiently at a profit.

The purpose of a physical therapy department in a hospital should be twofold. Primarily it is to furnish indicated treatment to referred patients; to complete the work of the surgeon; to assist the physician in bringing his patient

back to normal health; to repair or restore function; to improve the patient's morale; to make a producer; to minimize the financial burden.

Secondarily, it would seem equally important, to furnish to the physician the real scientific knowledge about physical therapeutics; advising and assisting him as regards physical agents in medical practice; encouraging the local medical profession to delve into the rational application of the various procedures; to afford opportunity for medical research and practical study of the real value of physical therapeutics; to acquaint the medical student with the fundamental principles and applications; to train the hospital interne in prescribing sane physical therapy; to familiarize the nurse in training with the use of water, heat, postural methods, and massage, toward the better handling of patients; to train technicians to understand and manipulate the rather complex physical therapy apparatus and adequately administer the various treatments under the supervision of a regular physician.

Why should the hospital furnish and control physical therapy treatment?

Because bedridden and handicapped patients can be treated with greatest benefit only in a hospital.

Because industrial patients, even the ambulatory class, receive proper recording and adequate treatment in a hospital.

Because the patient's convalescence will be materially shortened and the medical cost minimized through availability of this hospital facility.

Because the hospital as the community medical center must educate the medical profession and the citizen in the right and wrong features of a much abused medical specialty.

—Harry Lesslie Langnecker, M.D., Director of Department of Physical Therapy, Stanford University Hospital, San Francisco.

Read at the meeting of the American Hospital Association, Session on Special Hospital Problems, San Francisco, August 6-10, 1928.



INTERNATIONAL ABSTRACTS

The Present Status of Therapy of Cancer of the Uterus. John Osborn Polak, Radiological Rev., June, 1928. P. 226.

In this country and in Europe radium has replaced the radical operation in the treatment of all cases of cervical cancer except possibly in incipient growths upon the portial surface. Even in these, high primary operative mortality more than balances the possible advantage of operation. In cancer of the body preoperative radiation followed by total hysterectomy with post-operative radiation is the accepted procedure. Our personal experience favors preoperative radiation a month or six weeks prior to extirpation.

The Present Status of Physical Therapy. Frank B. Granger, Bull. New York Acad. Med., July, 1928. P. 790.

1. Physical therapeutic measures of treatment are being placed on a sound and rational basis.
2. Physical therapy has secured civil and governmental recognition as one of the triad of medicine, surgery and physical therapy.
3. Nearly all the mysticism and much of the empiricism formerly inherent in physical therapy has been removed.
4. The wide spread laboratory and scientific clinical investigations which are now under way will soon make it a more exact art.
5. In many conditions complete physical and functional restoration can only be secured by the use of physical therapeutics as an adjunct to standard medical and surgical procedures.
6. To secure this teamwork is essential.
7. Physical therapy should be practiced on a broad and comprehensive basis.
8. If it is so practiced not only will the time of disability be shortened, but many who otherwise would have been hopeless cripples will be returned to financial independence.

The Status of the Roentgenologist. Orville N. Meland, Radiological Rev., 1928. P. 311.

The x-ray has proven very beneficial to the physician in the past few years and its progress is so marked that the physician rarely diagnoses a case without the help of the roentgenologist. The author quotes McVicar as saying: "In our opinion roentgenologic examinations excel any and all other means of recognizing cancer early." Faulty diagnosis is often due to incorrect interpretation rather than the fault of the picture. It is very important that the radiologist know the anatomy, physiology and pathology of normal and ab-

normal forms as produced on the x-ray plate. It is essential that the radiologist follow the case through once he has been referred to in making the diagnosis.

Simple Colitis. Barton A. Rhinehart. Radiological Rev., Aug., 1928. P. 319.

The diagnosis of simple colitis is difficult and often impossible from history and physical findings. It is very often confused with chronic appendicitis, peptic ulcer, cholecystitis, adhesions and other organic diseases. The x-ray findings are definite and can establish the diagnosis.

The Fluroscopic Removal of Metallic Foreign Bodies in the Bronchi. D. Campbell Smyth. New England J. of Med., June 14, 1928. P. 887.

1. Fluoroscopy should be regarded as a first aid and not as a last resort in the removal of opaque foreign bodies from the bronchial tree.
2. It should be at hand in all cases where the foreign body has been in the lung for a long period, making the chances of seeing it by direct vision or of feeling it, very small.
3. It should be used after one attempt at removal by direct vision has failed, provided the attempt has been made by a competent bronchoscopist, and everything possible has been done at the first trial.
4. The mortality is not appreciably raised by this method.
5. The anesthetic should be selected according to the conditions to combat.
6. Fluroscopic removal is preferable to removal of the foreign body by tactile sensation alone.
7. Under general anesthesia the excursion of the foreign body can be controlled by an assistant fixing the diaphragm on the side of the intruder. This is of very great assistance in accurate grasping of the intruder. This point, so far as I know, is new.
8. Provided no acute condition is present, the duration of bronchoscopy in adults is of secondary importance, the most important thing being gentleness, which means lack of any trauma. In other words, the bronchoscopist should not strive primarily for speed, but should rather exercise the greatest patience and his manipulations should be the most gentle possible. This conclusion is not based on the series of cases reported in this paper alone, but rather the result of my observations in quite a considerable number of foreign bodies in the air passages of fairly long duration.
9. An expert fluoroscopist is necessary and should share fifty-fifty any success achieved by the operator.

X-ray and Radium Treatment of Carcinoma of the Cervix. R. E. Fricke, *Radiological Review*, July, 1928. P. 276.

The cardinal points in successful treatment of cancer of the cervix are:

1. Careful examination and biopsy in all cases for purposes of classification and prognosis.
2. Massive treatment at the outset with radium alone or radium and roentgen rays.
3. Frequent and careful examination at intervals, with further biopsies and additional treatment when indicated.
4. Continued insistence on early examinations, and to this end education of the public by repetition of the early symptoms and signs. Improvement in results is dependent in large measure on the treatment of this insidious disease in the earliest stages.

X-ray Treatment of Certain Diseases. L. B. Morrison, *The New England J. Med.*, Aug. 23, 1928. P. 371.

The author describes the characteristics of the different rays—soft and hard rays. Statistics show that roentgen ray treatment relieves cough, bronchitis and asthma. In whooping cough it is also valuable, but only in the second stage in the opinion of the author. The roentgen ray has proved a valuable aid also in the cure of low grade infections, furunculosis and carbuncles, erysipelas, keloids, warts, acne, chronic myelogenous leukemia and the author states that roentgen therapy is the logical treatment for Hodgkin's disease.

The problem of cancer would not be so complicated if the public would present themselves for a physical examination before symptoms appear and if the patient, physician and radiologist would co-operate. He quotes Dr. Greenough as saying that irradiation is not a cure in itself, but should be combined with surgery and in the author's opinion the radiation should be preoperative. The author concludes with the advice that roentgen therapy should be employed only by those having a thorough knowledge of it.

Radiation Treatment of Glioma of the Brain. George H. Hyslop and Maurice Lenz, *Am. J. of Med. Sc.*, July, 1928. P. 42.

1. Beneficial palliative results of radiation treatment of gliomata of the brain are of a sufficient degree and frequency to warrant its further trial. Tables I and II indicate that gliomata fall into two groups as far as expectancy of life is concerned. Patients dying within less than a year after operation respond less favorably to radiation treatment than patients whose tumors allow a longer duration of life. Of our 19 verified cases eight showed some degree of benefit from radiation treatment and two were possibly helped. Improvement was in some instances rather striking in degree and occurred repeatedly in the same individual. Of the three unverified cases, two were strikingly improved. The dangers of immediate reaction are exemplified in two cases.

2. The tumors in our small series known to be cellular in nature show benefit from treatment in a greater proportion of cases than those which were not cellular. The benefit consists of relief of increased intracranial pressure and diminution of focal signs and symptoms. The duration of relief in a given case cannot be predicted.

3. The patients seem to vary in their immediate reaction to radiation. For this reason it is desirable to determine the patient's tolerance by making the first application a fraction of the so-called erythema dose. This precaution is especially important in patients with posterior fossa tumors or with marked intracranial pressure.

4. Preoperative radiation has certain obvious dangers or disadvantages that make the procedure inadvisable. Experimentation under very careful observation of the patient is justified, but clinically, it is difficult to evaluate results.

5. It seems desirable to administer maximum doses within four to five weeks after the institution of radiotherapy. The dose to be given should be based on the size, location and depth of the tumor.

6. Ionization measurements of the effective dosages which were measured at possible sites of deep-seated gliomas show that, from a physical standpoint: (a) Roentgen ray therapy with intermediate or low voltage is inferior to high-voltage roentgen ray therapy or a 6 c.cm. radium pack; (b) the higher-depth dose of high-voltage radiation would, for similar reasons, appear to be slightly more desirable than a 6 c.cm. radium pack for lesions which are further than 5 c.cm. from the surface; (c) if the intermediate voltage roentgen ray therapy is used, one-third of the surface may be absorbed by the skull; this should be taken into account at the time of the craniotomy when the question is considered whether to leave out the bone flap. If high voltage roentgen ray therapy or the radium pack are to be used, much less radiation is absorbed by the skull.

Roentgenotherapy in Certain Types of Neuritis and Neuralgia. Frances A. Ford, *Minn. Med.*, June, 1928. P. 368.

A study of the analgesia produced by irradiation in eight cases of diabetic neuritis has shown only partial and gradual relief in about half the cases. In three cases of residual pain following herpetic inflammation temporary relief occurred in one case, gradual improvement in one, and in one, with the exception of a few days of freedom from pain after the second application, the treatment seemed rather to aggravate symptoms. Five cases of sciatic neuralgia, most of which were associated with chronic infectious arthritis (only one case affording objective data on which to base a diagnosis neuritis), illustrated in each case the effectiveness of irradiation in securing relief of pain, usually within from twelve to twenty-four hours.

More comprehensive data with regard to the effect of irradiation in different varieties of nerve and inflammatory lesions must be assembled before a possible in-

terpretation can be reached (from a clinical point of view) of the underlying mechanism by which pain is alleviated. Because of the freedom of this method of treatment from any injurious effect or tedious administration, and the gratifying result as yet unexplained in many dissimilar conditions, the use of the roentgen ray for securing analgesia is worthy of trial in all cases of severe pain.

It is to be emphasized that the irradiation required for this purpose lies well within the limit of tissue tolerance, and in this field in which there is clearly no indication for intensive irradiation, the radiotherapist has a responsibility in the avoidance of radiodermatitis, the occurrence of which even in first-degree stages has done so much to prejudice the general public against the therapeutic use of roentgen rays.

The Roentgenogram in Mastoid Disease.
Henry K. Taylor, *Am. J. Roentgenol.*, June, 1928. Page 522.

1. Mastoid roentgenography is an aid to otologic diagnosis. It should not over-weigh the clinical findings.

2. A roentgenogram of the mastoid should give the following information:

- (a) Anatomical data.
- (b) Variations in density.
- (c) Absence or presence of a destructive lesion.
- (d) Absence or presence of a productive lesion.

3. A history of a previous acute otitic infection must be taken into consideration when estimating the significance of a localized area of destruction on a roentgenogram.

4. A mastoiditis which shows only a mild involvement, as evidenced by decreased illumination and slight destructive changes, may clear up without operative intervention. A progression of destructive changes in an acute otitic infection indicates that the lesion is active.

5. The finding of a sclerotic mastoid in itself is no indication for operation.

6. The clinical findings should furnish the chief guide to procedure.

Giant Cell Tumor of the Spine. Albertus Cotton, *Am. J. Roentgenol.*, July, 1928. P. 18.

1. Giant cell tumor of bone of the epulis type is essentially a benign lesion and can be cured by appropriate treatment.

2. It occurs most frequently in the second or third decade, but may occur in younger or older patient.

3. There is evidence of previous injury in a large proportion of cases.

4. The gross and microscopic pathology is very characteristic.

5. The roentgen ray findings, while not pathognomic, are one of our most valuable aids in diagnosis.

6. Giant cell tumor of the spine is rare as compared with the same lesion in the ends of the long bones and the jaws—not over 3 per cent of cases.

7. The diagnosis may be difficult and require the aid of the history, clinical, laboratory and roentgen ray findings together with explanatory operation and examination of the gross and microscopic tissues.

8. A differential diagnosis from the other destructive lesions of the spinal column is important because of the difference in prognosis and methods of treatment.

9. The prognosis of giant cell tumor of the spine is good with appropriate treatment. Cure is accomplished by bone production in the diseased area.

10. The treatment is exploratory—operative removal of tumor tissue and loose bone and relief of pressure on the spinal cord or cauda equina. Postoperative roentgen irradiation is beneficial.

11. Recovery of function of paralyzed muscles depends upon the extent of damage to the cord or nerves of the cauda equina.

The Roentgenological Study of the Neck.
Samuel Brown, *Am. J. Roentgenol.*, Sept. 1928. P. 208.

The lateral view of the neck enables the visualization of the soft tissues, which has proven to be of some practical value in the study of these structures, especially of the thyroid and trachea. Though this work is relatively new, physicians have already become interested, as shown by the number of requests we receive for such examinations. Thus far, we have found very little of practical value in the study of the larynx. However, in time we may learn to recognize abnormal conditions in this organ.

A number of illustrations have been chosen from a large collection of cases to demonstrate the value of this type of examination.

Roentgenology of the Colon. J. W. Larimore, *Am. J. Roentgenol. and Radium Therap.*, Aug., 1928. Pp. 101-113.

The author has attempted to illustrate in these demonstrations which have been limited to those of purely medical import, first, that roentgenology reveals many alterations of colonic physiology, and second, that the understanding of these depends upon and is in proportion to their correlation with general clinical findings. This field of observation is as yet relatively untouched and will prove fertile with the help of correlated clinical observations.

Diathermy in Pneumonia. F. B. Freeland, *Medical Sentinel*, Sept., 1928. P. 581.

The author quotes statistics extracted from a report of the local bureau of health which states that over 600 deaths occurred as a result of pneumonia. That pneumonia is one of the most prevalent and fatal of all acute diseases and that it exceeds tuberculosis as a cause of death is an established fact. Norris and Landis place the mortality from lobar pneumonia at over 20 per cent and broncho-pneumonia rates even higher. The author quotes Dr. Harry E. Stewart in his article. "Dia-

thermy and Its Application to Penumonia," as stating that only one death had occurred in those cases of pneumonia which were treated by diathermy before the third day. From this statement, it is made clear that all cases of suspected pneumonia should be treated by diathermy *early* in the disease. The author quotes Dr. Stewart also in his answer of "What Is the Rationale and Clinical Change which the Treatment Induces in the Patient?" This question is answered in detail. The application of diathermy must be employed by one who is skilled in the technic of administration. The knowledge of the type of pneumonia, stage of disease and the pathology are very necessary to the physician.

A Comparison of the Quantitative Biological Effects of Gamma and X-rays. Charles Packard, J. Cancer Research, March, 1928. P. 60.

1. The course of the death curve for *drosophila* eggs is the same whether gamma or x-ray are used as a lethal agent.

2. Measured doses of x-rays kill definite proportions of eggs. It is therefore possible to make a direct comparison between the activity of gamma and x-rays.

3. The assumption that equal quantitative biological effects produced by these two radiations indicate equal intensities is reasonable but not proved.

4. *Drosophila* eggs furnish an excellent material for experiments of this kind.

Physical Therapeutic Methods in Otolaryngology. A. R. Hollender and M. H. Cottle, III. Med. J., Sept., 1928. P. 191.

1. Improved results in many aural and rhinological conditions have prompted a continued use of physical agents.

2. Radiant heat light is indicated chiefly in acute inflammatory processes.

3. Ultra violet energy has given encouraging results in nasal and aural affections and also in some general diseases which influence the ear, nose and throat.

4. Diathermy may be applied either by the direct or indirect methods to the nasal accessory sinuses, the ears, the larynx, or to other parts.

5. The direct method has been greatly simplified by special apparatus and electrodes.

6. Metallic ionization has been employed with good effects in some intranasal and intra-aural diseases, but has given the most gratifying results in chronic purulent otitis media of the uncomplicated type.

Experiences with Roentgen Therapy in Prostate Hypertrophy. Rudolf Oppenheimer, The Urologic and Cutaneous Rev., Oct., 1928. P. 662.

1. Moderate x-ray doses combined with massage of the prostate in the first stage of prostate hypertrophy ameliorate the irritative manifestations and especially

the frequent strangury, and improve the subjective complaints in a great number of cases.

2. On the other hand, this form of therapy does not prevent the further development of the malady, particularly the occurrence of chronic retention.

3. X-raying of the prostate can have a favorable effect in cases of prostatic bleeding.

4. Small x-ray doses prove ineffective in cases of acute retention.

5. Any form of x-ray therapy is ineffective in cases of chronic retention.

6. The application of large doses can make an existent cystitis much worse, make more difficult a later necessary prostatectomy and retard or completely prevent the wound healing.

The Council on Physical Therapy, Organization, Scope and Activities. A. U. Desjardins, J. A. M. A., Oct. 6, 1928. P. 1025.

Until recent years physical therapy has suffered in reputation. This was due mainly to the fact that incompetent physicians were attempting to employ it and also to the sale of various kinds of apparatus by companies who were not qualified in manufacturing them.

In 1925 a resolution was passed to the effect that a committee be appointed to investigate the value and merits of the apparatus offered for sale to physicians and hospitals. One of the most important questions is the lack of teaching physical therapy in the medical schools today. Another complication is the use of unscientific expressions which the committee is attempting to correct. The selection of glass for ultraviolet radiation is difficult for the physician due to the many and various kinds on the market of which many are of inferior construction. The committee has progressed favorably in this line in selecting the correct glass.

The rental of radium by physicians is not a good idea. Radium should be employed only by skilled physicians.

The Effect of the High Frequency Current d'Arsonval on the Skin. I. I. Sohmimanko, and L. S. Bermann, The Urologic and Cutaneous Review, Sept., 1928. P. 565.

1. The discharge (effluence) of the high frequency current (d'Arsonval current) and the spark discharge originating thereby produce a conflicting effect upon the skin. The spark appears to be the most efficacious factor.

2. Two factors are to be differentiated in the interpretation of the nature of the spark effect. The first is the result of a purely mechanical influence. The second is characterized by an alternation in the reaction power of the skin (sensitization).

3. The bipolar method is distinguished by its more pronounced traumatic effect. On the contrary the sensitizing effect is seen in this method in a slight degree only.

4. The mechanical and biological effects of the current explain its therapeutic influence by which an improved transportation of blood, an evident subsidence of pathological products, a lively granulation, etc., are produced. At the same time the possibility of the occurrence of skin eruptions of allergic character is not ruled out in cases with increased reactive powers. This latter point offers us a contra-indication for the use of strong sparking of extremely sensitive skins. In all cases of this type the application of stroma discharge without sparks is more suitable.

Economics in Roentgenology. Edw. S. Blaine, *Ill. Med. J.*, June, 1928. P. 419.

The author emphasizes the fact that there are too many laymen owning and operating x-ray establishments and encourages the physicians to send their patients to the men who are qualified as this is the only way of abolishing these men from the roentgen ray field. By this means the men who are actually competent will have an opportunity to establish their practice. The laymen who offer rebate to the referring physician and have cheaper rates than registered roentgenologists should be condemned.

The Effect of Irradiation on the Suprarenal Gland. A. U. Desjardins, *Am. J. Roentgenol.*, May, 1928. P. 453.

Much of the experimental work bearing on the biologic action of irradiation of the suprarenal glands is of doubtful value, because it has often been based on unfounded assumptions, and many of the records of such experiments show that roentgen rays may cause pathologic changes in the suprarenal gland, but strong doses—doses well beyond the therapeutic range for human beings—must be used to induce such changes. The pathologic alterations affect chiefly the cortical portion of the gland; medullary changes also may occur, but this portion of the organ is distinctly less susceptible to irradiation than the cortex. In spite of the morphologic disturbances in the suprarenal produced by irradiation under experimental conditions, the health of the animals was not deleteriously influenced. Therefore, since the suprarenal factor influencing blood pressure is chiefly a product of the medullary cells, the ground for the contention that irradiation can diminish blood pressure in hypertension is not solid. The same consideration makes it difficult to accept the idea of Dresel, and Beumer, that irradiation of the suprarenal glands can diminish the blood sugar of diabetic patients, and that of Holdfelder and Peiper, and others, that the acute suprarenal insufficiency manifested by five patients following irradiation could be attributed to pathologic alterations in the suprarenal glands induced by such irradiation. There does not appear to be much basis for the contention that the suprarenal gland is particularly sensitive to irradiation, more so even than the small intestine. The evidence points clearly in the opposite direction.

Treatment of Mouth and Face Conditions by Irradiation. Ira J. Kaplan, *Am. J. Roentgenol.*, May, 1928. P. 437.

In this method use is made of a combination of deep roentgen therapy and irradiation by radium emanation. The radium work is carried out with long platinum filter needles for puncture procedures, and wax molds with heavily filtered applicators for surface applications.

In all cases biopsy is done following preliminary mouth hygiene and disinfection.

Treatment is given in small doses applied over a long period of time and not repeated.

The reaction is never very severe, and necrosis seldom occurs.

Roentgen Therapy of Brain Tumors, with Special Reference to Astrocytomas. Paul Martin, *Am. J. Roentgenol.*, May, 1928. P. 432.

1. Three verified cases of astrocytoma are described which were not at all influenced by roentgen treatment.

2. For the appreciation of the effects of roentgen therapy only histologically verified cases ought to be taken into consideration.

3. Before undertaking roentgen treatment of a brain tumor one should at least perform a decompression and every attempt should be made to establish a correct pathological diagnosis.

Roentgenological Aid in the Diagnosis of Ileus. James T. Case, *Am. J. Roentgenol.*, May, 1928. P. 413.

1. This paper makes no attempt to discount any of the usual clinical signs of acute obstruction of the intestines. It emphasizes once more an additional sign, available through bedside roentgen ray study, first published by us in 1914.

2. This roentgen ray study at the bedside disturbs the patient very little, if any at all. No dressings are removed. The patient is not turned on the face, but is left supine.

3. Usually no opaque medium is given, though it may be used with profit and without harm in most instances (barium-water-lactose mixture). An opaque enema (barium-oil) is sometimes helpful.

4. A diagnosis of acute obstruction is based on the finding of dilated coils of small intestine, herring-bone aspect, ladder arrangement visualized by gas, or gas and fluid accumulations.

5. The method is valuable in both acute and chronic ileus. In the latter, the patient is better examined in the erect position; the diagnosis is based on broad (not high) gas pockets over fluid levels in abnormal situations. In acute cases, the erect position is usually not feasible, and studies are made in lateral and supine positions where the diagnosis depends on recognition of Kerkring's folds in dilated, parallel loops of intestine.

6. The method is of special value immediately after operation in abdominal cases.

7. The chief value lies in the ability to determine by roentgen rays the existence of dilated loops of bowel; to differentiate gas in small bowel from colonic gas; to estimate the actual caliber of the intestinal loops thus visualized; to estimate the approximate site of the obstruction, but mainly to confirm the fact of ileus before proceeding to the emergency operation. In the absence of dilated intestinal loops, one doubts the facts of ileus.

Status of Roentgenology in Gastro-Enterology.

Lewis Gregory Cole, Surg. Clin. of North America, October, 1928. P. 1007.

It is a well established fact that roentgenology is an aid in diagnosing gastro-intestinal diseases. The roentgenologist should, from the x-ray picture interpret not only his findings, but it is his place to tell the physician the position, size, etc., and the kind of treatment the picture would indicate. The influence of the societies of roentgenology which have been organized in the past few years has exceeded that of any other specialty in its influence upon medicine. The fact that there are men posing as roentgenologists who are not qualified to do so is due to the medical schools, in that they do not provide the training which the students should have in this particular line of work. Serial x-rays are very valuable. Once the roentgenologist has interpreted the picture, he should follow up the case the best he can as this will prove very beneficial in his work in the future.

Facts and Fancies Regarding the Use of X-rays in Progressive Medicine. Edw. S. Blaine, Ill. Med. J., Aug., 1928. P. 123.

X-rays applied to the human body are potent for much good in diagnosis and treatment.

An x-ray examination is not attended by any such happenings as electrical shocks to the patients, the appearance of lightning, of flames, jolts or other fancied disagreeable events.

X-ray dangers lie in the possible damages resulting from the incompetency or inexperience of non-medical x-ray workers in commercial x-ray laboratories.

X-rays used in diagnosis and treatment should be applied only by physicians skilled in this special medical work.

The commercial x-ray laboratory owned and operated by laymen should be avoided by physicians and patients, as not in the best interest of the sick seeking medical help and relief.

Periodic health examinations by the family physicians, assisted by proper x-ray studies offer the safeguard against disease.

Roentgen Diagnosis of Gall Bladder Disease.

I. W. Held, Surg. Clin. of North America, October, 1928. P. 1223.

Roentgen ray study has proved to be an invaluable aid in the diagnosis of gall-bladder disease. The direct and indirect method should be employed. The object of the direct method is to visualize the gall-bladder

region with and without the administration of the dye. The method of Graham (cholecystography) is by far the most valuable. This method enables us to study the function of the gall-bladder, and also makes it possible to visualize cholesterinized stones in a large percentage of cases. It shows with a high degree of exactness whether the shadows in the right hypochondrium belong to the gall-bladder. The non-visualization of the gall-bladder after the administration of the dye is particularly valuable as it indicates a diseased condition. The oral administration is very reliable and promises to replace the intravenous method entirely. This method is accessible to all workers interested in the field of roentgen ray diagnosis.

The rectal method is of no value. The intrajejunal administration of the dye through the duodenal tube (Stewart and Einhorn) should be reserved only for such cases where the drug cannot be retained by mouth, and there the intravenous method is contra-indicated because of existing cardiovascular disease. It should be reserved also for cases of extreme asthenia and for very obese individuals whose cubital veins cannot be reached.

The indirect method of roentgen ray study of the gall-bladder which has as its object the determination of the functional disturbance of the gastro-intestinal tract resulting from gall-bladder disease should not be abandoned. The most important diagnostic signs obtained by this method are: Pyloric spasm, delay in the emptying of the stomach, and dextra position of the pylorus and duodenum.

On the Bucky Rays. M. Saidman, la Presse medicale 28, April 7, 1923.

These rays, called by the Germans grenzstrahlen, are ultraviolet rays produced by a Coolidge tube with a Lindemann window, transmitted under a pressure of 8-10 kilovolts. The reactions which they produce are not of the severity of radiodermatitis, although they last longer than those of ultraviolet rays. The most interesting results in dermatology were obtained by the author in certain cases of eczema and varicose ulcers. It seems that the majority of indications given by Bucky cannot be confirmed. Therapeutic results are quicker with rays of 8 Angstroms than with those of Bucky.

The effect of High Voltage Short Wave Length Roentgen Ray Exposure on the Circulating Blood Cells. Richard P. Stetson, New England J. Med., July 12, 1928. P. 76.

1. High voltage, short wave lengths roentgen ray exposure in doses of between 1000 and 2400 electrostatic units produces a marked transitory and a slightly prolonged depression of the bone marrow as is evidenced by a decrease in the number of white blood cells in the peripheral circulation.

2. This depression is probably never severe enough in cases without a primary disease of the hemopoietic tissues to preclude the repetition of roentgen ray treatment when general indications make this advisable after a four to six weeks' interval.

3. Patients with 8,000 or more white blood cells per cubic millimeter before roentgen ray exposure are less likely to develop leukopenia afterwards than patients with a lower white blood cell level.

Experimental Studies on the Effects of Roentgen Rays on the Cause of Inflammations, in Comparison with Other Physical Methods. R. Motojima, Strahlentherapie, 29, Heft 1, 1928.

The favorable effect of roentgen rays on inflammations can also be demonstrated by animal experiments using the proper experimental procedures. The best method to pursue is the Schaeffer thread method with chemical and bactericidal stimuli.

The favorable effect of the rays is shown by a decrease of the inflammatory infiltration around the source of irritation. There is a certain dosage scale which varies according to the art of the individual and local conditions. Local and general processes play a role in the effect. The general processes belong to the group of the non-specific increase in immunity. The local processes consist primarily in hyperemia, increased lymph flow, and local immunity processes. Abscess formation can be favorably affected, particularly with strong dosage.

The effect of roentgen rays on inflammation is most similar to the effect of heat and least to the effect of cold. A combination of heat and roentgen treatment is more effectual with the proper dosage, than either heat or roentgen treatment alone.

Effect of Electric on Vitrally Stained Frog Leukocytes. F. Haberlandt, Strahlentherapie, 29, 1, 1928

Frog leukocytes, vitally stained with Nile blue sulphate, which were irradiated with a 22 candle osram lamp, showed at first an intensification of the stain, and then a destaining of the protoplasm, followed by that of the nucleus, granules and serrated reticulum. The cause of the intensification of the dye is the change in the degree of dispersion of the dye in solution in the cell (the actual cause is the introduction of energy by the light rays). The author gives three explanations for the destaining process. One explanation is that the dye became "disproportionated." The molecules are arranged into two opposite reactions: one part is reduced or oxidized at the expense of the other, or since O_2 free substances are also subjected to the disproportionality, one part becomes water-poor or water-rich at the expense of the other. Such changes are effected catalytically by light. Since Nile blue sulphate is destained by reduction or oxidation, the destaining of the preparation can be explained by the phenomenon of disproportionality.

Since amitotic division may be seen after prolonged irradiation, it is justifiable to assume that as a result of the irradiation, metabolic products arise in the leuko-

cytes which profoundly affect the life process. One cannot always separate the purely biological processes from the physicochemical or purely chemical. Bovie and Hughes have demonstrated the formation of toxic "light products" as a result of exposure to light. According to these authors, the toxic products were stimulating in small amounts and depressing in large quantities. The favorable effects of the irradiation is undeniable even in the relatively small intensities used in the author's experiments.

Practical Apparatus for Measuring Dosage of Ultraviolet Rays. B. Rajewsky, Strahlentherapie, 29, 1, 1928.

The author describes a simple measuring apparatus for ultraviolet radiation which is well adapted for medical dosimetry. It is possible to obtain with the instrument, the measurement of intensity of radiation and the full dose administered at the point of application. The sensitivity of the apparatus can very easily be adapted to the sensitivity of the skin. The author gives the results of test measurements of the new apparatus in relation to its electrical and optical properties as well as its relation to erythematous and bactericidal effects. The article includes a picture of the row and held by a screw. The nut also serves as a holder for various filters. Quartz glass, ultraviolet glass, etc., can serve as the window pane, depending on the range of radiation to be measured. A metal plate which is set parallel to the window serves as the electrode. The size of the chamber can be varied in different cases. The following dimensions of the inner ionization chamber and the electrode have been found practicable: chamber approximately 11 cm square, electrode approximately 8 cm square. The chamber can be connected with an electrometer or electroSCOPE, depending on the sensitivity desired.

Action of Irradiated Ergosterin in Animal Experimentation. W. Pfannenstiel, Munchen. Med. Wchnschr. 26, June 29, 1928.

The administration of large doses of irradiated ergosterin produces in healthy young rabbits, acute, rapidly fatal toxic symptoms. Even with a long continued administration of small doses of only two drops of 1 per cent ergosterin solution, the animals became sick with the typical symptoms of hypervitaminosis (loss of appetite, emaciation and loss of weight), and succumbed if the administration of vigantol was not interrupted in time. With discontinuation of the treatment the disease symptoms disappeared within a week, to reappear with the readministration of vigantol. Only one animal, whose vitamin metabolism was in a natural equilibrium, seemed to react to the administration of pure vitamin D with toxic symptoms. Rabbits made artificially rachitic did not suffer injurious effects through overdosage with vigantol. On the basis of these results, the treatment of completely healthy children and adults with this preparation is to be

looked at not only as purposeless but also as injurious. Clinical experiences to speak in favor of this conclusion in that after a long vigantol medication, not infrequently there ensue loss of appetite and weight. In healthy adults, high vigantol doses affect the mineral metabolism in an opposite way from smaller doses in rachitic children.

Relation Between Structure and Prognosis in Cervical Carcinoma Under Radiation Treatment. Wm. P. Healy and Max Cutler, *Amer. Jour. of Obs. and Gyn.*, July, 1928, Vol. 16:15.

Healy and Cutler histologically classified cervical carcinoma into three groups based upon their degree of anaplasia. Group one, the adult type, has a squamous cell arrangement, with tendencies to hornification and occasional pearl formation. The other extreme, or group three, shows a complete loss of cell differentiation, no squamous characteristics, atypical qualities, and diffuse infiltrations with numerous atypical mitosis. The cells are small, round or spindle in form and the nucleus hyperchromatic. Group two is an intermediate one. The squamous cell characters are slight or lacking, the growth may be atypical but lacks diffuse infiltration. The cells are large and frequently show a plexiform arrangement. The treatment carried on consisted in the application of radium in massive doses at the site of the primary lesion by means of buried emanation, vaginal applicators and intracervical and uterine capsules. This was combined with the use of x-ray. The most anaplastic, or group three, proved to be the most radiosensitive as demonstrated by tabulated comparisons. The percentage cured (by the latter term the authors mean freedom from disease for four or five years) was always significantly higher in group three. The prognosis was more favorable than the early cases, but when compared side by side, early or advanced carcinomas, the tumors in group three responded most favorably. Although from a histologic standpoint this group is the most malignant, the gratifying response to radiation therapy leads the authors to call this the less malignant when treated in this way. With this therapy the prognosis becomes better as the anaplasia becomes more marked. On the other hand group one is the most radio-resistant and the response by surgical procedures seems to be slightly better.

—Alfred J. Kobak.

Radium Therapy of Tuberculous Skin and Gland Diseases. P. Alegrais and A. Bellot, *Presse Med.*, 13, 1928.

Radium is not a specific for these diseases, but it gives wonderful results. Since radium rays have no elective effect on lupus, they must be applied in quite a different manner from their application in skin epithelioma. Deep irradiations must correspond to

the thickness of the disease process. The flat Lack apparatus and the tubes are indispensable, the former of a square shape of about the size of 1-16 sq. cm. with 1-1, 1/2 mg. R. units per sq. cm. In order to make use of the combined rays of radium, a metal filtering must under no circumstances be used. The tubes with 1/2 mm. thick platinum wall have a capacity of 5-8, 11 and 13 mg. R. Units. In tuberculous lupus a differentiation should be made between the elevated proliferations from the infiltrated forms. The former are painlessly destroyed by using the unfiltered Lack apparatus, protected only by a thin layer of gauze which remains one to one and a half hours *in situ*. In ten to fifteen days a crusted ulcer is formed, which in nine to eight weeks leaves a soft lupoid scar. With moderately deep infiltrations the Lack apparatus is also used, with, however, 1/10 to 4/10 lead filtration; the time interval is three to ten hours, the longer duration for a stronger filtering. A thin layer of gauze is interposed as a means for protection against secondary irradiations. With deep infiltration the tubes alone are better adapted. They may be used for one and one-half to three hours or with a 1/2 to 1 mm. silver plate, up to five or six hours. The secondary radiation is absorbed by 2 mm. cork or by an india rubber tube. Treatment is repeated every two months. Finally a smooth, somewhat shiny, but soft scar results.

Small, resistant nodules in the scar must be destroyed by the galvanocautery. Lupus of the mucous membrane is very amenable to radium irradiation. Tubes are introduced into the nose according to the depth of infiltration, with or without plates of silver or india rubber, for about one and one-half to two and one-half hours. As a rule, results immediately follow.

Fundamentals in Electro Medical Technic (New Galvanic Connecting Apparatus) G. Oppenheim, *Klin. Wchnschr.*, 7, 8, 1928.

The previous connecting apparatus with rotary transformer had the disadvantage that there resulted no pure constant current from the delivered galvanic current. The current showed a certain irregularity and the character of a rapidly oscillating current. Although the oscillations do not show in the galvanometer needle they are demonstrable in the oscillograph and by the telephone. The author, in conjunction with the engineer, G. Ernst, has constructed an apparatus in which the transformation of the alternating current of the street system into the direct current is not accomplished by the use of the rotating motor dynamo, but by what is known in the radio industry as the double straight tube. This transforms the alternating current into an oscillating direct current. The oscillations are then caused to disappear by a "sieve chain," so that a pure galvanic current results. The apparatus, which is completely free from grounding, is supplied in two forms, "Partax" and "Ortax" by the medical house in Frankfurt a. M.

Heliotherapy in the Mountains. A. Rollier, Strahlentherapie 28, Heft. 2.

The sun harmonizes well with the mountain climate. The mountains are advantageous for heliotherapy because the irradiation by the sunlight is more equal than in the valley; because the amount of radiation of the body heat is very slight in winter and in consequence of the decreased atmospheric pressure, more favorable effects in respiration and circulation are obtained. In addition, the mountain climate has also antitoxic, stimulating, and antipyretic qualities. The author considers in detail the dosage and shows by means of numerous illustrations his remarkable success.

Carcinomatous Disease Process of Tissues. B. Sokoloff, Les Neoplasmes, 7, 2, 1928.

This process, studied by the author for the last ten years, is not only extremely interesting from the standpoint of the carcinoma problem, but is also important from the point of view of the fundamental problems in histogenesis. A disturbance in the intercellular relations brings about an anarchy of cells. The nature of sensitivity to rays consists primarily in changes brought about by radium rays in the lipoids between and within cells. There results a change in the absorption and adsorption processes in the tissues. The physical changes which occur in the cell membranes and intercellular lipoids as a result of the action of roentgen and radium rays, consist in a change of the viscosity of the lipid and of the intercellular fibrin-collagenous substance. In order to clear up these problems, the author investigated the radiation sensitivity of protozoa by irradiating cultures of paramecium caudatum and of gregarins by means of radium. He was able to observe a complete analogy between the radiation sensitivity of protozoa cells and that of carcinoma cells. On the basis of his experiment he is able to confirm the Erdmann hypothesis that carcinoma is a disease of metabolism. The process of the carcinomatous disease of the cell is divisible into two stages. At first there is a change and disturbance in the equilibrium within the tissue. Changes which affect the equilibrium within the tissues are the disturbed ionic equilibrium, the disturbances in the metabolism of vitamins and cholesterol, and the changes in the viscosity of intercellular lipoids. Tissues with a greater morphogenetic and regenerative power, resist more successfully any disturbance in its equilibrium. In the second stage, the cells with the changed lipid membranes, having been freed of the tissue influence, begin to develop their potential energy. The cell does not form a part of the tissue any more, but becomes autonomous and does not obey the laws of histogenesis.

Glass which Transmits Ultraviolet Rays. C. Dorno, Strahlentherapie 29, 1.

The tendency is to be too one-sided in considering ultraviolet. On practical and hygienical grounds, an increase in the transmissibility of rays in the visible

spectrum should also be considered in the substitution of better glass for the window glass in use today. The actinic rays (violet, blue, blue-green), also possess bactericidal properties. The ultra-red rays are strongly absorbed by the universal window glass, and have a heat effect from within. Improvement of the transmissibility of glass for ultra-red should be just as important as its transmissibility for ultraviolet. The most biologically effective short wave ultraviolet rays, 313-290 μ are completely absorbed by the ordinary window glass. German ultravit, 1927, English vita, 1926, are recent kinds of ultraviolet glass. In addition to the good transmissibility for ultraviolet rays, the spacial distribution is also important.

On a New Method of Treating Pruritis Senilis. J. Borak, Strahlentherapie 29, 2, 1928.

Pruritis senilis is a result of a metabolic disturbance. This consists of an abnormal increase of protein metabolism and a consequent accumulation in the tissues of protein decomposition products. These abnormal products sensitize the nerve endings in such a way that, as a result of various stimuli, the sensation of pruritis results. This is analogous to the way the carbohydrate metabolic products in diabetes lead to pruritis. Similar to the manner in which the metabolism in diabetic pruritis is improved by insulin, the disturbance in the protein metabolism in essential pruritis senilis can be improved by roentgen irradiation of the hypophysis or thyroid gland. Of 10 cases of pruritis senilis treated in this manner and in which various methods were formerly tried without success, eight were considerably improved without success, light were considerably improved within a week after irradiation of one of the two glands (seven after irradiation of the hypophysis and one after irradiation of the thyroid) and remained cured during an observation period of two and one-half years. Two youthful cases with a generalized pruritis were also treated in a similar manner with success. On the contrary, the method failed in most cases of localized pruritis (vulvae, ani dorsi, faciei). Forms of local pruritis should therefore be treated by local methods.

Diverticula of the Stomach. William K. Kalbfleisch, Am. J. Roentgenol., Sept., 1928. P. 218.

A case of diverticulum of the posterior wall of the stomach near the cardia is reported. It produced no gastric or other clinical symptoms and is therefore supposed to be congenital. The diagnosis was made by roentgen examination alone.

Due to the uncertainty of clinical symptoms, the preoperative diagnosis of diverticula of the stomach rests upon the roentgen examination. Stress is laid upon the roentgenoscopic examination in the upright and supine positions and especially in the oblique views.

A review of the accessible literature with an attempt to explain the etiology of diverticula of the stomach is given. Decision as to treatment depends

upon the symptoms. No definite rules can be laid down. It should, however, be kept in mind that every diverticulum is potentially liable to the development of cancer.

Chronaxy and Its Significance for Electrodiagnosis. E. Blumenfeldt, *Klin. Wchnschr.* 7, 3, 1928.

The term chronaxy is used to indicate the shortest stimulation time required to cause a minimal contraction. Striped skeletal muscles react differently to the stimulation time. Depending on the rate of contraction, characteristic differences arise which are closely related to the function of the muscles in the body. Thus the distal muscles at the extremities have a greater chronaxy than the proximal ones; likewise the extensors of the same group have a greater chronaxy than the flexors. For normal motor muscle function, Bourguignon formulates the following law: All muscles acting synergically in a movement, form a group characterized by having the same chronaxy. The flexors of the thigh have the smallest chronaxy, (0.08-0.16). The extensors, taking the gastrocnemius as an example, have the greatest, (0.44-0.72). In the infant, the chronaxy values of the skeletal muscles are up to ten times as large as in the adult, and the differences between the extensors and the flexors have not as yet become typical. The sensitivity chronaxy of the skin agrees almost exactly with the chronaxy values of the underlying musculature. The pathologically changed neuromuscular system may show very considerable differences from normal values. These reach the greatest degree in the paralytic stage in which a slow myotonic contraction of the involved muscle is demonstrable. The chief cause of the chronaxy change is, however, the disturbed biological function and not the anatomic substratum. In a functional disturbance of one side, the chronaxy of the healthy uninvolved side is also affected. This phenomenon is called by Bourguignon reperussion (reflex effect).

Natural and Artificial Heliotherapy in Pulmonary Tuberculosis. L. Herz, *Scalpel*, 81, 14, 1928.

Since the effectual rays of natural sunlight are, to a great extent, absorbed by fog, dust and smoke in many cities, the author recommends the application of artificial light sources, particularly quartz light and Finzen light, which are equal in their effect to natural sunlight, although all diseases cannot be cured by these methods. The chief indication is tuberculosis, particularly, pulmonary tuberculosis, in which the author has had good results. General irradiation, which is never to last more than one-half hour is preferred to local irradiation. There have never occurred any serious complications in the author's experience.

On Artificial Hyperthermy Through Physical Means and Its Therapeutic Application. F. Walinski, *Med. Klinik*, 24, 13, 1928.

Walinski has made experimental investigations as to whether it would be possible to cause an artificial fever by physical methods, similar to the fever caused by vaccines, milk, bacteria and malaria, which would

have a therapeutic effect in disease. At the same time the experiments were to determine whether infection or fever is the effectual factor. For this purpose, the author employed hot baths, with or without packing after the bath, and hypertonic salt solution. By means of a combination of bath packing and salt infusion, he succeeded in generating a pyrexia similar in degree and duration to an infectious fever. The author treated 14 cases of paralysis, lues cerebri, tabes, multiple sclerosis, arthritis deformans, and joint ankylosis in this way. While the pyrexia, which was well borne, caused an improvement in the condition, and resulted in no bad after effects; there was found an increased protein catabolism and a retention of sodium chloride. The cause of the increased protein catabolism could not be determined with certainty. The retention of sodium chloride was due to a water retention, which is the cause of the high degree of temperature obtained.

Twenty-five years of Heliotherapy of Surgical Affections. O. Bernard, *Strahlentherapie*, 28, Heft 2, 1928.

The author, whose work in light therapy is well known, has summarized his experiences in this paper. As indications for heliotherapy of surgical diseases, he notes: 1. Wounds. Purely traumatic wounds are considered in which primary union is not expected, such as gunshot wounds, lacerations and concussions; also such wounds are considered which are due to circulatory disturbances or trophic nervous disturbances, such as ulcers cruris, or malum perforans pedis, burns and frost bites, caustic wounds, roentgen burns, infectious wounds (phlegmon, paronychia, furuncle, carbuncle, bubo, chronic abscess, fistulae as a result of empyema, mastitis, etc.) 2. osteomyelitis, 3. fractures, 4. syphilitic ulcers which show little tendency to heal despite specific treatment, 5. skin carcinoma, 6. rickets, 7. the great field of surgical tuberculosis.

In wound healing, heliotherapy has an antiseptic as well as analgesic effect. In osteomyelitis, heliotherapy is mostly employed only after operation, although these are cases which heal under local and general irradiation, without operation. In skin carcinoma, light treatment can, of course, only be considered as a supportive measure, after operation or after roentgen irradiation.

Surgical tuberculosis can be called the most important field for the indication of heliotherapy. Of 1000 cases, 858 were cured, 120 improved, whereas only 14 died, that is a mortality of 1½ per cent. The following includes the various kinds of tuberculosis: skin tuberculosis, tendon sheath and bursa; tuberculosis of the lymph gland, of the bones and joints; uro-genital tuberculosis, the serous membranes and tuberculous arthritis preceding rheumatism; intestinal tuberculosis and multiple localizations.

Point of Attack and Manner of Action of Ultraviolet Rays in Metabolism in Child's Body. H. Koeppel and G. Lauber, *Arch. F. Kdhlk.*, 1928, 84.

On the basis of the demonstrable effect of ultraviolet rays on red blood corpuscles, the authors worked

out a practical and utilizable method of measurement. It consists of the following: 150 ccm. of fresh blood are mixed with 10 ccm. of 0.9 No. C1, and 5 ccm. of the resulting mixture are exposed to the rays of the quartz lamp. The irradiated mixture is centrifuged and 2 ccm. of the supernatant liquid is removed and replaced by an equal amount of 0.4 per cent hydrochloric acid. This sample is now compared with the test solution which is made by mixing 4 ccm. of the original blood and salt solution mixture with 1 ccm. of 0.4 per cent salt solution. The test solution is given the value 100. Both solutions are compared colorimetrically and the color of the sample of irradiated blood is calculated in terms of percent of test solution. The Leitz colorimeter is used. The authors reached a high degree of accuracy in the readings. They were able to reduce the subjective factors of error to a minimum. They made numerous experiments with the method on the effects of various kinds of lamps. They also investigated the influence of distance from the source of light on the effect of ultraviolet rays and the significance of the duration of irradiation. They found that the quartz light did not emit ultraviolet rays equally in all directions, but that there were more intensive rays on the anode side. During the burning, the intensity of the rays sinks considerably, but even then the intensity of the rays is not equal.

On the Effect of Pigment on the Quantity of Infra-red Rays Reflected by the Skin. W. Kartschagin, Ztschr. F. D. Gfs. Phys. Therap. 35, Heft 1, 1928.

The results of the author's work solve the problem of the reflection of infra-red rays from pigmented living skin. These rays enter the organism in varying amounts (38 to 58 per cent), depending on the degree of pigmentation of the skin.

We know the percentage of energy of the various rays of the visible and invisible spectrum which enters the organism during exposure to sunlight. The author gives the following table in which he includes the results obtained with infra-red rays:

Pa. of the	KIND OF RAYS						
	Infra-red	Red	Yellow	Green	Blue	Violet	Ultra-violet
unpigmented skin	38	62	76	79	82	85	87
Pa. of the							
pigmented skin	58	80	88	91	92	94	92

The table indicates that the content of the light falling on the exposed organism is very different from that of the light entering the organism. In addition, the author gives a table which shows that light entering an organism with pigmented skin is relatively richer in long waved rays than light entering an organism with unpigmented skin.

An apparatus was constructed which may be called the skin-photometer for infra-red rays. This apparatus has been tested with a considerable amount of material.

The percentage of infra-red rays reflected by the unpigmented middle skin has been determined. The decrease in the reflecting capacity of the skin towards infra-red rays with an increase in pigmentation has been determined and measured. The author has noted the change in reflecting capacity towards infra-red rays as affected by depigmentation.

Light Therapy in Ophthalmology. B. Hirschfeld, Strahlenther, April 28, No. 2, 1928.

Irradiation by means of the Birch-Hirschfeld ultraviolet lamp is particularly indicated in *ulcus serpens corneae*. The favorable results of irradiation are such that, whereas, formerly 32 per cent became blind with these diseases, only 6 per cent of all cases become blind now after the introduction of irradiation treatment. Good results are obtained in *keratitis superficialis* and in *herpes corneae*. *Scrofulous* and *gonorrheal* diseases and even *ulcus rodens* yield for the most part very good results. In addition to local measures, general treatment with ultraviolet light is very useful in tuberculous diseases. Weak doses of roentgen irradiation are indicated in inflammations of retina, choroid and iris.

On the Treatment of Laryngeal Carcinoma. Senys, Presse Med. 30, 1928.

Only operation (thyrectomy, laryngotomy, laryngo fissure) is indicated in certain carcinomas which are definitely localized in the beginning, to which belong in particular, the carcinomas at the free edge of the vocal cords. In the treatment of the rest of the epitheliomas, other therapeutic measures may be considered. Roentgen irradiation gives only slight and transient results with, at the same time, the danger of cartilage necrosis. Very good results were obtained, in particular, in neoplasms of the anterior commissure, by the introduction of radium needles into the tumor mass, after screening the thyroid cartilage. The problem is more difficult in diseases of the glands in which surgery is helpless. The only hope lies in the gamma irradiation of the diseased or suspected parts, with the exclusion of the healthy parts, which can only be accomplished by means of cross fired narrow bundles of rays. The apparatus, built for this purpose by the author, proved to be very good for gamma deep therapy with multiple localizable ray bundles. A very exact method of measurement is necessary.

Irradiation of the Spleen in General Medicine. Bienfait, Liege Med. 21, 19, 1928.

Irradiation does not act on the leucocytes themselves, but on the structure of the spleen, the function of which it activates. Lymphocytolysins arise in the blood, and the lymphocytolysis leads to a reaction which expresses itself in the form of a hyperleucocytolysis. Irradiation of the spleen causes an actual hemoclastic shock which is employed therapeutically in various diseases, particularly in asthma. There is a close relationship between the amount of leucocytolysins and alexins in the blood of patients with irradiated spleens.

With a rise in the leucocytolysin titre of the blood there is not only an increase in alexins but also of antibodies. After irradiation of the spleen the coagulability of the blood is greatly increased. This effect is used prophylactically before abdominal operations in icterics, and therapeutically in metrorrhagias and other hemorrhages. Irradiation of the spleen has also an effect on the bone marrow, either directly or indirectly, causing the formation of red cells. Irradiation of the spleen is therefore indicated in leukemic anemia and is contra-indicated in polycythemia. An exact localization of the rays is necessary; irradiation of the liver brings about the formation of antileukocytolysins. Irradiation of the adrenals in small doses has a favorable effect. It causes the production of a hyperglycaemia and hypercalcaemia; and thus by a quick transformation of the phoserozyme into serozyme and the early appearance of thrombin caused an increase in the coagulability of the blood.

Contribution to the Knowledge of Hyposensitivity of the Skin to Roentgen Rays. L. Haas, Strahlenther, April 29, 3, 1928.

In a 20-year-old patient a very large dosage was administered without the occurrence of any unpleasant reaction. The expected therapeutic effect occurred only after a very high dose was given. The patient suffered from hyperhidrosis manus and was given during a period of six to eight weeks 220 per cent H. E. D. until the first improvement was noticed. After receiving a total of 265 per cent there was an improvement of the syndrome, although no skin reaction had occurred as yet. To explain this, hyporeactivity is assumed. There were also cases of skin hyposensitivity in hyperhidrosis, in which doses of 130 to 180 were required. In other cases, 10 to 20 per cent above the normal roentgen ray dose was required before bringing about epilation or erythema. The author says that the hyposensitivity has practical significance. It is due to a poor blood supply of the skin. The skin sensitivity in the case mentioned above is not only lowered for roentgen rays but also for adrenalin and dermatographism.

Photobiological Effect of Irradiation. J. Risler, A. Philibert and J. Courtier, Compt. Rend. Acad., 186, 17, 1928.

The authors have performed some interesting experiments in the irradiation of various bacterial cultures with rays from various sources. By means of a lamp constructed by the authors, they succeeded in destroying a staphylococcus aureus culture in about one-twenty-fifth of a second, that is 150 times quicker than with a mercury lamp of 3500 candles. The principle of the lamp is based on the conduction of an electric current through very many fine aluminum threads, the momentary volatilization of which causes a radiation of a very great penetrating power which extends very far in the ultra-violet, and perhaps extends even further until the roentgen ray wave length is reached. The effect is stronger with a larger gap and a greater intensity. In

another series of experiments the authors succeeded in destroying certain microbes by sensitizing them towards light. They made use of the pimachrome of the Baden Aniline factory, for sensitization, and killed the sensitized tubercle bacillus cultures by irradiation with the neon lamp in the extraordinary short time of fifteen to thirty minutes.

General Principles of Roentgen Therapy in Non-Carcinomatous Diseases. M. Joly, Progres Med. 24, 1928.

The author discusses the general physical principles and laws of roentgen therapy and the effect of irradiation on skin, testicles, ovaries, blood, glands, the vegetative nervous system, inflammatory phenomena, eczema, lichen planus, psoriasis, acne, warts, mycosis fungoides, syccosis, trichophytis, irradiation on the hypophysis, in Basedow's disease, adrenals, adenoma of the prostate, and thymus hypertrophy. He stresses the good results of roentgen therapy in metrorrhagia of the menopause and in uterine fibroids, and the successful application of the x-ray treatment in America, to hypertrophic tonsils. Successful results are obtained in ulcer ventriculi, hyperchlorhydria, bronchial asthma, adnexal disease, puerperal septicaemia, prostatitis, various forms of surgical tuberculosis, syringomyelia, anterior poliomyelitis, and neuritides of various kinds.

On Lumbago. E. Siegmund, Wien. Klin. Wchnschr. 41, 5, 1928.

After discussing the literature, the author reaches the conclusion, on the basis of his experiments and observations, that lumbago is an affection of the vertebral joints, and that the tension of the back musculature is to be explained by the continued painlessness of a forced posture. The author recommends as treatment eight to fourteen days' rest in bed, with local heat and irritating ointments. General warm baths are useless, and massage, electricity, quartz light, sollux lamp, etc., seem to have no particular effect. If after two weeks the pain has not considerably decreased one should resort to body stimulation therapy (series of 25 injections, twice a week, intracutaneous, 0.1 or more; also Pondorf mixed vaccine B.). In severe cases of spondylarthritis paravertebra, 10 to 20 cc. of sterile 1 per cent sodium bicarbonate are to be injected twice a week.

On the Effect of Light Baths on High Blood Pressure. H. Marks and F. W. Muller, Klin. Wchnschr., 7, 17, 1928.

Hypertension due to disease reacts more strongly to physical stimuli of vasomotor nerves than the normal condition. The authors employed incandescent light, body baths, and local baths of organs, as mild and well dosaged vasomotor stimuli. In addition to the relatively weak light effect, radiant heat plays a very important role. The experiments were performed on ambulatory patients under the greatest possible uniform conditions. Perspiration occurred simultaneously

with an increased blood pressure, so that the patients were not allowed any fluid at least four hours before irradiation. After the initial rise all experiments on 21 patients showed a definite fall in blood pressure during the light bath, the greatest decrease occurring during the first ten to forty minutes. The amount of fall in blood pressure depended on the initial values; the effect was proportionately stronger as when the original rise was higher. This is indicated by a table and two curves. A third of the patients showed a permanent effect, four were not affected. Essential hypertension and several cases of arteriosclerosis reacted best. They also showed an improvement in their subjective symptoms.

Physical Therapy in General and Hospital Practice. Richard Kovacs, Long Island Med. J., Sept., 1928. P. 509.

Physical therapy has been found to benefit a wide range of conditions. To apply it successfully, a knowledge of the entire field of medicine is required, as well as the mode of action and the technic of the various measures. In applying physical therapy, the physician should ask himself if the pathology requires the employment of physical measures and if so which one. The working knowledge can be acquired by easy stages, taking up one set of measures after the other. Once it is reached it will prove invaluable to both practitioner and specialist.

X-ray Diagnosis of Eventration of the Diaphragm of Children. A. E. Uspensky, Brit. J. Radiol., June, 1928. P. 197.

1. In all five cases of the eventration of the left half of the diaphragm in children we had different signs.
2. It is possible to divide all signs into four groups: pleuropulmonal, cardial, gastro-intestinal and mixed.
3. In all cases the mentioned disease was discovered, thanks to fluoroscopic examination.
4. From our point of view we must look on the eventration of the diaphragm as a congenital anomaly of the development of the diaphragm.
5. All exterior factors, pleural adhesions, lesions of the alimentary tract, meteorism, aerophagia are favorable moments and not etiological factors of this disease.
6. Not only can the air cap of the stomach be eventrated, as some authors indicate, but also other organs of the abdominal cavity (the spleen, case No. 1).

The Use of Iodized Oil for the X-ray Examination of Disease of the Female Pelvis. Julius Brams and Jack R. Lavieri, Ill. Med. J., June, 1928. P. 410.

The use of iodized oil in the diagnosis of disease of the female pelvis is a very valuable diagnostic procedure and should be a part of the complete examination wherever possible. Many diseases cannot be diagnosed without it.

A new syringe for the injection of the oil is described which is believed to be an improvement over those ordinarily used for this purpose.

The lateral position of the injected uterus is suggested to determine the position of the uterus when the bimanual examination is doubtful.

Roentgen Therapy in the Mycotic Diseases of the Skin. Hans Fritsch, The Urological and Cutaneous Review, Sept., 1928. P. 570.

1. X-ray therapy is the method of choice in the treatment of certain forms of the mycotic dermatoses, e. g., trichophytosis (Unna), and favus.
2. The effect of the x-ray depends not upon destruction of the fungus, but rather upon the depilation, by which the exciting cause is removed with the defluvium. The possibility that probably in particular types (trichophytia profunda barbae) local and general immunizing occurrences, also can play a role should not be summarily dismissed.
3. In certain types local depilatory treatment can be carried out, but generally total depilation of the diseased hair is desired to obtain a rapid and permanent cure. Repeated depilation at short intervals is followed by damage to the skin and the new hair. If the necessity arises, depilation should be proceeded with again after an interval of not less than three months with local raying and the smallest effective dose.
4. The exact technic, the after treatment, and prophylaxis are to be emphasized as worthy of especial attention.

The Percussion of the Heart Borders and the Roentgen Ray Shadow of the Heart. A Study of One Hundred Cases. Chester M. Kurtz, Am. J. Med. Soc., August, 1928. P. 181.

1. One hundred individuals with normal and abnormal hearts have been studied by percussion and roentgen ray measurements of the borders of the heart and great vessels.
2. Percussion is of value for the following reasons: (a) It is reasonably accurate, as shown by comparison with the seven-foot roentgen ray plate; (b) a roentgen ray plate is often difficult or impossible to obtain; (c) it is simple, rapid and requires no apparatus; (d) it is a valuable check on the accuracy of roentgen ray technic and interpretation.
3. The apex impulse is not always as accurate as the left border of dullness, but is often easier to determine on physical examination. It should always be checked against the left border of dullness in the fifth (or sixth) space and compared with the midclavicular line. Palpation of the apex impulse may sometimes give a more accurate evidence of the position of the cardiac apex than can be obtained from the seven-foot roentgen ray film when the shadow of the apex is obscured in other shadows.
4. The nipple line is too variable to be of any value in determining enlargement. The midclavicular line is a much more reliable index.

5. Percussion should always be attempted in the third left interspace, as this may be the only portion of the heart which is enlarged to physical examination, as in mitral stenosis and congenital heart disease.

6. Percussion in the second interspace, both to left and right, and in the fourth right interspace should always be attempted, because in case of marked increase widening can usually be detected even though the measurements themselves are bound to be inexact.

Toxic Goiter; Its Diagnosis and Treatment.
J. Thompson Stevens, *Am. J. Roentgenol.*
June, 1928. P. 539.

1. The terminology together with results obtained by radiotherapeutic and surgical authorities are reviewed briefly.

2. Correctly applied radiation therapy is second to no other method of treatment, and may be expected to cure about 90 per cent of the cases.

3. The pathology, etiology, symptoms, physical findings, metabolic estimations, and diagnosis are stated.

4. The part played by foci of infection is discussed.

5. The indications and contra-indications are reviewed at some length.

6. The technic for both radium and roentgen treatments is stated and the clinical course following this method of treatment outlined.

7. Seven cases are recorded for illustration of results obtained.

Radiation Therapy in Benign Uterine Hemorrhage. Chas. L. Martin, *Texas St. J. Med.*, Aug. 1928, P. 280.

Questionnaires received from 71 women treated for benign uterine hemorrhage with radiation during the past seven years were analyzed.

Sixty-one of these patients received radiation sufficient to produce the menopause. Most of them were past 40 years of age. Ninety per cent reported an improvement in their general condition and the majority stated that they were stronger and that their color was definitely better. Seventy per cent gained in weight with an average gain of 13.8 pounds. The hemorrhage was controlled in every case and in 38 it stopped immediately after the treatment was given. It rarely lasted more than fifteen days after radiation. Twenty-five patients had no menstrual periods after they were treated, but one, two or even three periods were reported by some. Nineteen women had no vaginal discharge after radiation regardless of the belief that radium always produces some discharge. Ten patients had no hot flashes during the menopause. However, the remaining 51 had them in varying degrees for periods lasting from one to four years. Thirty-six patients thought they were definitely less nervous after the artificial menopause than before and 14 could notice no change in their nervous condition. Thirty-nine claimed a lessening of mental depression rather an increase as has so often been claimed, and 15 could observe no change in their mental condition. Fifteen

women complained of headache during the menopause and 28 of an unusual abdominal distention or "bloating." On the whole the good results far outweighed the less desirable ones and almost without exception the patients in this group spoke highly of the outcome of their treatment.

Six young women suffering from an essential hemorrhage were given small doses of radium. There was a return of normal menstruation and a marked improvement in health in each instance.

Four somewhat older women with menorrhagia received small doses of radium with temporary improvement in every case. However, only one of the four appears to have remained well.

The Treatment of Hyperthyroidism. Edward Reese, *Am. J. Roentgenol.*, June, 1928. P. 546.

1. The so-called medical treatment of hyperthyroidism is inferior to surgery and radiation and should not be used alone unless the patient declines specific treatment.

2. Medical supervision in association with surgical or radiation therapy is of the greatest importance, particularly in relation to visceral complications.

3. Removal of active harmful foci of infection should accompany or precede any type of treatment selected.

4. A trial with radium or roentgen rays is indicated:

(a) In mild or acute cases of hyperplastic type without complication, where a three to four months' period of observation is economically possible and without risk to the patient.

(b) In cases of any type which are considered bad surgical risks; in these subsequent operation can often be successfully performed.

5. Surgical treatment is indicated:

(a) In all frankly adenomatous goiters with hyperthyroidism.

(b) In all cases of hyperthyroidism with visceral complications.

(c) In all cases which have not responded satisfactorily to irradiation after four to six months.

6. Until more convincing statistical proof of the ultimate efficacy of irradiation is offered, surgery must be considered, in general, the most satisfactory type of treatment for hyperthyroidism.

One twelve plate Waite & Barlett static machine including two motors of one-fourth H.P. each. One for D. C. current—the other for A. C. Current. Reasonable.

Archives of Physical Therapy,
X-Ray, Radium.
1216 Medical Arts Bldg.,
Key No. 432. Omaha, Nebr.